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Factors Affecting Nurse Staffing in Acute Care Hospitals: A Review and Critique of the Literature

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Factors Affecting Nurse Staffing in Acute Care Hospitals: A Review and Critique of the Literature

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FOREWORD

Over the past two decades, much has been written on nurse staffing methodologies. The continuing search for rational methods of responding effectively to changing patient care needs in the acute care setting has led to an evolution of more or less formal techniques for patient assessment, classification, and the allocation of nursing staff based on quantified predictions of required care activities. The value of such procedures was recognized recently by the Joint Commission on Accreditation of Hospitals, which mandated the use of patient classification systems as a means for determining appropriate use of nursing resources.

Many questions, however, remain unanswered--questions relating to productivity, quality, and costs. Attempts to implement and evaluate the variety of staffing methodologies that currently exist are confounded by the myriad operational and environmental factors that influence the provision of nursing care activities. Moreover, the emergence of primary nursing care as a potentially more effective organizational mode than either functional or team nursing has created uncertainties as to the manner and extent to which such an organizational mode can be implemented in specific settings.

As a comprehensive sourcebook of the literature on nurse staffing methodologies, this document should provide an excellent guide for future research in this area. The most recent literature on important input, operational, and environmental factors that affect staffing is reviewed and criticized. Deficiencies in research and evaluation are highlighted and numerous areas for further research are suggested.

The nursing component of the National Health Planning Information Center provides health planners with a centralized, comprehensive source of information on nurse manpower planning to facilitate an improved health care delivery system in the United States. The component acquires, screens, synthesizes, disseminates, and makes available specialized documentary material on nursing, as well as methodological information on a wide variety of topics relevant to health planning and resources development.

Jo Eleanor Elliott

Jo Eleanor Elliott
Director
Division of Nursing

PREFACE

This monograph, published as part of the Nurse Planning Information Series, is intended to provide a sourcebook of the literature on factors affecting nurse staffing in acute care hospitals. Recent articles and reports on a number of important input, operational, and environmental factors affecting staffing are reviewed and critiqued. This information should be valuable to all those concerned with the effective provision of nursing care and will be of interest to researchers, educators, administrators, and practitioners alike. Numerous areas for further investigation are suggested and the importance of methodologically sound studies for evaluating the impact of various staffing innovations is emphasized.

This document represents a component of a larger project entitled "Evaluation of Staffing Patterns in Hospitals," funded under Contract No. HRA 232-78-0150. A supplemental document, entitled "A Comparative Study of Team and Primary Nursing Care on Two Surgical Inpatient Units of a Teaching Hospital," describes research efforts that evaluated the impact of primary nursing as carried out at the Johns Hopkins Hospital.

The authors wish to thank their project officer, Ms. Patricia A. Deiman for her guidance throughout the preparation of this monograph. The invaluable advice and assistance of Dr. Eugene Levine and Ms. Virginia Saba are gratefully acknowledged. Thanks are also due to Dr. Myrtle K. Aydelotte, Dr. Carol A. Lindeman, and Dr. Gloria G. Mayer, Advisory Committee to the project, for their many useful suggestions on the content of this review. Finally, the authors extend their sincere thanks to Ms. Renate Wilson for her editorial advice.

TABLE OF CONTENTS

Foreword		iii
Preface		v
Chapter 1	Introduction	1
Chapter 2	The Conceptual Framework	11
Chapter 3	Methods of Review	25
Chapter 4	Input Factors: Personnel	35
	Educational Preparation of Nurses	35
	Nurse Staffing Patterns	48
	The Use of Part-time and Agency Personnel	59
Chapter 5	Input Factors: Patient Care Requirements	69
Chapter 6	Operational Factors: Management	87
	Nursing Service Organization	87
	Unit Management	93
	Scheduling	104
	The Modified Workweek	111
Chapter 7	Operational Factors: Organizational Modes of Nursing	123
	Team Nursing, the Loeb Center System, and Unit Assignment	124
	Primary Nursing Care	141
Chapter 8	Environmental Factors	181
	Unit Design	181
	The Use of Computers	191
	The Unit Dose System	201
Chapter 9	Summary and Recommendations	213
Appendix A	Literature Citations: Alphabetical Index	223
Appendix B	Literature Citations: Index by Subject Area	255
Appendix C	Secondary References	291

Chapter 1

INTRODUCTION

Nurse staffing problems are perennial and universal. The history of nursing can be said to be, in large part, a history of attempts to respond to patient care needs with an appropriate organization and allocation of nurse staffing resources. The choice, however, of optimal strategies for the provision of patient care is complicated by underlying natural forces that give rise to an erratic flow of patients through hospital facilities and by concomitant uncertainty as to expected demands.

The essentially stochastic nature of demand for acute care was recognized by Balintfy (1960, 1962) and Flagle (1960), who argued that, from a theoretical point of view, every individual in a population has a small but finite chance of becoming ill or having an accident on a given day, and that such events are intrinsically random and independent, if one disregards epidemics and catastrophes. Under these conditions, one would expect the number of unscheduled arrivals to acute care hospital inpatient units during a limited period of time, such as a day, to be distributed according to the well-known Poisson probability distribution. Young (1962a) verified these findings and showed that, as a rough approximation, the Poisson distribution could indeed be used to predict the number of admissions per day of both scheduled and unscheduled patients, and could also be used to describe the daily bed occupancy for most inpatient units in an acute care facility.

To some extent, nursing service administrators have long known that they are dealing with uncertainty in a system dominated by chance factors. Attempts to cope with this state of affairs have taken a variety of forms; of these, two are of fundamental significance. One is the development, over the past two decades, of more rational staffing methodologies for the effective allocation of nursing resources, and the other is an evolution in organizational modes for the delivery of nursing services. It is clear that many factors may affect both nurse staffing and organization; e.g., environment and operational policies. But the response to variability in patient care demands is primarily based on the implementation of appropriate staffing methodologies and the formation of compatible organizational structures. The two are inextricably related. The organizational mode will dictate the staffing methodologies that can be used; conversely, staff availability and the manner of allocation of staff constrain the kind of nursing organization that is feasible.

STAFFING METHODOLOGIES

For a long time, the difficulties inherent in anticipating patient care demands led inevitably to the use of historical bed utilization data to provide averages for predictive purposes; decisions related to the allocation of nursing resources were often based on measures of expected peak needs, as a function of average bed occupancy and of some tacitly accepted risk of shortage. Needless to say, such procedures have proven less than effective and have contributed to operational inefficiencies.

During the 1960s an important idea grew out of the recognition that health services must be viewed as a stochastic process. This was the general concept that patient needs, although variable, can nevertheless be identified quantitatively, and that models based on patient assessment and classification schemes can be developed that predict requirements for care. These predictions, in turn, form the basis for a more logical and effective allocation of nursing resources. Developed originally for acute care inpatient units, this fundamental notion is indeed now considered equally valid and applicable for long-term institutional care.

It can be argued that most current patient classification procedures and nurse staffing methodologies in acute care settings are based on the fundamental concepts proposed by Connor (1960, 1961) in his early studies of nursing unit staffing requirements. He showed that direct care predictions for an acute care inpatient unit can be expressed as a function of variable patient populations, categorized in terms of their individual care needs. Moreover, Connor found that if patients are assessed and their nursing care needs anticipated, more effective nurse staffing levels are possible than the commonly used staff ratios determined primarily by census counts. Simplified procedures for implementing the allocation of nursing staff, based on routine daily assessment and classification of patients, were devised by Young (1962). Models for assigning specific nursing skill levels to particular care task complexes were developed by Wolfe and Young (1965a, b) using mathematical programming approaches and relying on subjective utilities expressed by nursing staff; these models represent the first application of such techniques to problems of nursing unit staffing. The basic concepts of patient assessment and classification as a means for specifying nursing staff requirements have, over the past decade, been adopted, modified, and extended by many other researchers. The extent to which such procedures are used today is reflected in a comprehensive review of the literature by Aydelotte (1973), who summarized nearly 200 major methodological studies and provided a bibliography of more than 1000 staffing studies. More recently, Giovannetti (1978) provided an evaluation of the state of the art of patient classification;

such systems are now mandated by newly revised JCAH standards for nursing services.

Thus, nursing today is faced with a plethora of nurse staffing models or methodologies of varying degrees of usefulness or value. Levine and Kahn (1975), in a thorough assessment, have expressed dismay at the variety of approaches and procedures now in existence; further refinements of earlier models are continually being proposed, each claiming to offer improved patient care or more efficient staffing guidelines (Levine 1972; see also Warstler 1974). Some have called for incredible detail in determining care needs and require computer assistance in prescribing task assignments and the scheduling of personnel. There is mounting bewilderment as to which approaches are more effective than others; indeed, an evaluation study by Price (1970) has served primarily as a vehicle for urging a return to the use of bed census, with average nurse/patient ratios to determine staffing for inpatient units.

There is clearly a need for an objective evaluation of staffing methodologies, and the factors that influence their effectiveness, in order to determine the degree of rigor and specificity actually necessary, the appropriateness of their use, and the ultimate benefits of using one approach over another in specific settings. In other words, there are serious questions how well such refinements as standard times, detailed nurse assignment schedules, task difficulty scoring, computer-assisted assignments, extensive patient assessments, etc., correlate with the progress of patients during their hospital stay and with the quality of care rendered. It has also become painfully clear that many of the procedures being implemented are more administratively oriented than patient centered; there appears to be more concern for efficient or least-cost scheduling of nursing personnel than for an effective response to patient care needs. Complicating the choice of a rational staffing methodology has been an evolution in the philosophy and the organizational modes of nursing care.

ORGANIZATIONAL MODES OF NURSING

One of the most significant determinants of nurse staffing methodologies, and consequently of nurse staffing levels and patterns, is the organizational mode of nursing. Within this context, the term organizational mode encompasses both the philosophy of nursing and the manner in which nursing staff is organized in a nursing unit.

Marram, Schlegel, and Bevis (1974) argued that there have been and will continue to be many organizational modes for the provision of nursing care. To a large extent, these modes reflect a variety of means for assigning responsibility for patient care to nursing personnel, and although many have been defined more or less rigorously in the nursing literature, none exist in pure form; each mode has been modified or adapted for specific care settings in response to forces in the larger environment. Nevertheless, four common organizational modes are identifiable: the case method, functional nursing care, team nursing care, and, more recently, primary nursing care.

The Case Modality. One of the earliest recognized modes of nursing is the case method, which originated in private duty nursing when care was often given in the home (Hegyvary 1977). In this mode, one nurse was responsible for planning and administering care for one patient for as long as she was on duty. The case method has persisted, especially on intensive care units, although since the 1920s it has, for the most part, given way to other organizational modes of nursing. Nevertheless, as Ferguson (1977) has commented, "Plus ça change, plus c'est la même chose -- the more things change, the more they are the same." It can be argued that with the recent evolution of primary nursing care, nursing care may be coming full circle. Staffing for the case method is obviously dependent on the number of patients at hand; the skill levels required are dependent on the specific needs of each patient and his individualized care plan.

The Functional Modality. The functional mode of nursing organization was introduced in the 1920s and was based on industrial engineering principles of the division of labor and mass production. Assembly line techniques that had been found to be highly successful for increasing productivity in industry were applied to the nursing care process; if automobiles could be mass produced using a functional approach, why could nursing not be made more efficient by adopting the same approach? Division of labor was determined by the technical aspects of care tasks. In functional nursing care, responsibilities were allocated according to specific tasks; i.e., one nurse administered medications to all patients, another served meals, another changed linen, and others bathed patients. Usually, but not always, the more complex the task, the higher the skill level assigned to carry out the task.

It can be argued that functional nursing is an efficient way in which to utilize nursing staff with a wide range of skill levels, but at the cost of a shift to quantity and a deemphasis of quality. According to Marram, Schlegel, and Bevis (1974)

> ... the outcome [of the adoption of functional nursing] was the ability to take the technical functions of nursing and sort them into levels of complexity. The aide was given the simplest task that took little training; the vocational nurse was given the next level of function, those tasks requiring more training but that were not too complex; the registered nurse was given the most complex functions. Each person responded to his function, and little attention was provided to the patient who in the course of a day had to deal with four or five care givers, of whom none had particular responsibility for him as a unique

> whole person. His humanism was mechanized; his organismic whole was fractured into parts; his basic physiological and technical needs were reduced to a checklist on paper. Thus he became the automated patient... (p. 15).

Although functional nursing in its most depersonalized form is generally disclaimed by the nursing profession, modified forms persist. In many hospitals where team nursing has been adopted as an organizational mode, one still finds members of a team assigned to functional tasks for those patients within the team's responsibility. Given the skill levels that may be available to a nursing unit, such practices may be unavoidable. Staffing for functional nursing is, of course, highly dependent on variable patient care needs and the nursing resources at hand. A great deal of flexibility is possible in the assignment of care tasks to a given mix of skill levels; this may, however, have adverse effects on the quality of care provided.

The Team Modality. The team nursing mode of organization was largely a response to a crisis in nursing that originated during World War II. There was an acute shortage of registered nurses that continued beyond 1945. To meet postwar needs, health care workers were trained in a variety of technical skills on a wide range of levels that included aides, practical nurses, and diverse technicians. Hospitals absorbed droves of these workers, finding it more economical to staff nursing units with auxiliary personnel supervised by a registered nurse, especially when sufficient registered nurses to meet demand could not be recruited. Clearly, hospitals considered vocational nurses and aides as cheap sources of labor; but regardless of such considerations, the organization of nonprofessional nursing personnel under the supervision and guidance of a registered nurse team leader was a natural and logical solution to the shortage of registered nurses, ensuring, it was hoped, effective care to a designated group of patients. The team leader became responsible for planning the care for all patients assigned to the team and delegated many care activities to team members, while herself performing those that required high levels of nursing skill.

Team nursing has had mixed benefits in terms of effectiveness for patient care. Obviously, the burden of supervision, training, and patient care planning placed on the team leader is great; the quality of services provided to patients, and nursing unit morale, are therefore highly dependent on the team leader's competence or leadership abilities. Also, as noted earlier, the types of nonprofessional personnel available to a team leader often forced the use of functional nursing practices within a team. Depending on the number of registered nurses on the team, the demands on the team leader were often too great for one person; the actual time spent with patients became secondary to the supervisory functions of the team leader. Yet in many hospitals, team nursing is still viewed as the best way to organize for patient care, especially in those instances where a shortage of registered nurses continues to be a problem, or where registered nurses lack the competence or motivation for assuming the responsibilities associated with primary nursing care.

Most of the staffing methodologies that have been developed over the past two decades have been based on team nursing care. The majority have used patient classification schemes to specify only the total hours of nursing care required for a given patient population; the distribution of nursing care times, and nursing care activities, to particular skill levels has largely been left to the judgment of team leaders. As with functional nursing, a great deal of flexibility in the assignment of care tasks to skill levels is possible, but with team nursing more attention can be given to care planning and to the continuity of care.

The Primary Nursing Modality. Primary nursing care as an organizational mode was first attempted in the late 1960s as a response to growing dissatisfaction with the shared responsibility and the fragmentation of team nursing. Primary nursing, like the earlier case method, assigns one nurse to each patient. However, while the case method nurse may be responsible for a patient for one shift only, the primary nurse is responsible for a patient twenty-four hours a day for the duration of the care need or the length of hospitalization. The primary nurse assesses the patient's nursing care needs, formulates a care plan in collaboration with the patient and other health care personnel, and then assumes responsibility for seeing to it that the required care activities are carried out around the clock, every day. The primary nurse may delegate to a secondary, or associate, nurse the responsibility for executing the care plans on other shifts, but she never functions through a supervisory third person. It is argued (Marram, Schlegel, and Bevis 1974) that a primary nurse has three basic characteristics: autonomy, authority, and accountability. She has autonomy in that care is based on a nursing care plan developed essentially between herself and the patient. Collaboration with other relevant staff is close and continuing, but her activity is truly collaborative and not subordinate; the primary nurse has complete control of the nursing process at all times. The primary nurse has authority in that responsibility for care involves a comprehensive nursing care plan and its implementation on a 24-hour basis as long as care is needed. Finally, the primary nurse makes, and is accountable for, all decisions regarding patients in her care. This means accountability, standing behind decisions and actions; their consequences, good or bad, rest with the primary nurse.

Staffing methodologies for primary nursing care have not been formulated in any rigorous fashion. In most cases, it is assumed that the primary nurse must be a registered nurse, who may be responsible for the care of four to five patients. Thus, staffing for an inpatient unit is largely dictated by the number of patients on that unit, although patient needs may be taken into account in the assignment of patients to a primary nurse. Staffing, therefore, is less flexible than that for a team nursing unit; the intent, however, is to use highly skilled nursing professionals to improve, dramatically it is hoped, the quality of patient care.

ORGANIZATIONAL MODES AND STAFFING METHODOLOGIES

Many studies have observed that wide swings in demand for nursing care within an acute care nursing unit, from day to day and from shift to shift, are common and unavoidable, and that such variations in demand are largely independent of the number of patients on a unit. With few exceptions, nursing units are faced daily with the need either to augment or decrease their staffing levels if they wish to respond effectively to the requirements for care.

The dilemma at the unit level, therefore, is one of matching nursing unit personnel, a relatively fixed commodity on a nursing unit, to patient requirements for nursing care which are highly variable. As noted earlier, the response to this dilemma has, essentially, taken the form of more rational staffing methodologies and changes in organizational modes for the delivery of nursing services.

In terms of staffing, one may ask: What are the alternatives? One alternative is to do nothing. A resource deficit may then jeopardize care and lead to an overworked staff and a possible increase in overtime. A resource surplus, on the other hand, will increase "idle" time and nursing costs. A second alternative is to alter staffing levels according to anticipated needs as measured by patient assessment and classification. This may be done by using external resources, such as floating personnel from other units, part-time personnel, or temporary help from agencies. Although patient needs may apparently be met, there are disadvantages in terms of fragmented care, role conflicts, increased costs, and the lack of a cohesive staff. A third alternative is to alter patient workload by controlling admissions to the nursing unit; the intent is to achieve an equilibrium between care requirements and staff availability. Control of admissions is, of course, not always possible; in addition, changes in patient status cannot always be predicted with the degree of precision called for.

The concept of primary nursing care complicates these choices in terms of benefits and costs. Primary nursing as an organizational mode appears to place emphasis on a stable care load and a cohesive work group with well defined nurse-patient relationships. For example, upon admission to a nursing unit patients are assigned to a primary nurse with the intention that this nurse will be, for the length of their stay, the care planner and, whenever possible, the care provider. Thus, the alternatives described above may not all be possible for primary nursing. Costs associated with role conflict may be totally unacceptable for a unit practicing primary nursing. The question then is: are staffing methodologies currently in use suitable for nursing units that have well implemented or integrated assignment patterns based on primary nursing?

It is intuitively obvious that staffing methodologies are highly dependent on the organizational mode of nursing on a nursing unit. It is equally obvious that difficulties encountered in obtaining adequate staff and appropriate skill levels often dictate the organizational mode that can be implemented. If sufficient registered nurses with required skills are readily available, the case method or the primary nursing modality can be implemented, with the latter calling for increased responsibility and accountability for decisions. On the other hand, shortages of registered nurses inevitably force the use of a team modality, with more or less functional nursing care delegated to members of a team.

As noted earlier, most formal staffing methodologies currently in use are based on some form of team nursing. In many instances, although predictions for nursing staff have been derived from patient classification schemes, only total nursing hours required are indicated; the mix of specific skill levels on the team is left to the judgment of the nursing supervisor or the head nurse, and is frequently dependent more on available nursing resources than the needs of patients on a unit. Unquestionably, the implementation of staffing methodologies based on patient assessment and classification has proven effective in terms of utilization of nursing manpower and the response to patient care needs (Levine and Kahn 1975; Young 1975). But the emergence of the primary nursing care modality may make such methodologies obsolete or, at the least, may require extensive research leading to modifications of the procedures involved. At first glance, primary nursing care, with its direct and personal nurse-patient relationships, would seem to imply the use of a simple staffing ratio. It may be, however, that the assignment of patients to a primary nurse should depend on the expected needs of the patient, throughout his hospital stay, as determined by assessment and care plans.

PURPOSE OF THIS MONOGRAPH

The aim of this monograph is a critical review of the literature concerning factors affecting nurse staffing, with particular regard for the consequences of a movement from team nursing to primary nursing care. Two major reviews of the literature relating to nurse staffing have been published: *Nurse Staffing Methodology: A Review and Critique of Selected Literature* by M.K. Aydelotte in 1973, and *A Review and Evaluation of Nursing Productivity* by R.C. Jelinek et al. in 1976. It would serve no useful purpose to duplicate these excellent and comprehensive reviews; therefore, the aim in this monograph is to extract from these earlier documents those studies which have had the greatest impact on nurse staffing, and to evaluate in addition the relevant literature published since 1974.

A great deal of this recent literature has emphasized the positive aspects of primary nursing care. Much of the evolution of this organizational mode for nursing care has been linked to the drive for the professionalization of nursing. For good reasons, it is assumed that primary nursing, with its focus on autonomy, authority, and accountability, and with its concomitant requirement that patient care be provided on a one-to-one basis by highly skilled and competent registered nurses, cannot help but lead to more effective and higher quality care.

But, one may ask, have the claims for improved nursing care been substantiated? Indeed, given the exigencies of nursing manpower availability, is primary nursing care an ideal that can be realized only under rare circumstances? Will the perennial shortages of registered nurses ever be alleviated? Can new graduates from all educational programs function at the same level of responsibility? At what point are new graduates ready to assume the role of primary nurse? For that matter, is it desirable and cost-effective for all nursing staff to be comprised of highly skilled and educated registered nurses? Finally, staffing methodologies and organizational modes do not function in a vacuum. A host of operational and environmental factors influence the manner in which they are carried out in practice and their ultimate effectiveness.

Considerable research has focused on procedures for improving the effectiveness of team nursing through patient classification and staffing methodologies that provide optimal staff for meeting indicated needs. As will be seen, similar research has yet to be devoted to evaluating primary nursing care and the kinds of staffing methodologies it calls for. The art of nursing is evolving and there appears to be some uncertainty as to whether a modified form of the primary nursing care modality might not be the most practical or the most effective way in which to provide care of high quality.

Chapter 2

THE CONCEPTUAL FRAMEWORK

A principal concern of nursing administrators is how well their organization functions in providing services to its patient population. This concern has been deepened by the apparent shortage of qualified nursing personnel. Staffing for inpatient care is therefore a continuing problem, compounded by the underlying uncertainty in predicting day-to-day demands for care. As discussed in the previous chapter, several organizational modes for nursing care have been developed to cope with this state of affairs, of which primary nursing is the most recent. Each of these modes influences staffing methodologies; in turn, the number and kind of available staff often mandate or constrain the kind of nursing care organization that can be structured and implemented. Many operational and environmental factors may also influence staffing methodologies, such as nursing unit configuration, patient assessment and classification procedures, leadership and management policies, and the extent of decentralization of a hospital's functional components.

TERMINOLOGY

At the outset, it is important to define nurse staffing as well as several related and frequently used terms. For the purposes of this monograph, the term nurse staffing encompasses the methods, procedures, and philosophical concepts that relate to the numbers and kinds of nursing personnel required to provide a certain standard of care to the patients of an acute care inpatient facility.

Perhaps the most comprehensive interpretation of nurse staffing was given by Aydelotte (1973) in her delineation of the essential elements of a well conceived nurse staffing program. These include:

- A precise statement of the purpose of the institution and the services a patient can expect from it, including the standard and characteristics of care;
- The application of a specific method to determine the number and kinds of staff required to provide the care;
- The development of assignment patterns for staff from the application of personnel guidelines, policy statements, and procedures; and

- An evaluation of the product provided, and a judgment reflecting the impact of the staff upon quality of care.

As can be seen, nurse staffing is a somewhat general term that implies a broad range of activities and considerations. Within the overall framework of nurse staffing, however, are a number of specific terms that refer to several different aspects of the activities associated with staffing. Much of this terminology has been used interchangeably, and sometimes incorrectly, both in the general nursing literature and in the more definitive nursing research literature. The following definitions and interpretations are offered in an attempt to clarify and lend specificity and consistency to what has the potential for becoming a rather imprecise and conceptually confusing use of language.

- *Staffing levels*. Staffing levels refer to the gross number of nursing personnel designated for a given area, such as an inpatient nursing unit or a medical or surgical service. In many instances, the term may be operationalized to refer to the total nursing hours required per shift as indicated by one of the many staffing methodologies based on patient classification and workload estimation. Staffing levels may also be presented as the number of full-time equivalents. Usually, no attempt is made to specify skill levels.

- *Staffing ratios*. Staffing ratios refer to the number of nurses per patient day, or the nursing hours per patient day, required to provide tacitly accepted standards of care. Ratios are often used as a measure for estimating required nursing manpower resources and the expected cost of nursing services; prior to the introduction of more responsive staffing methodologies, they were frequently used for staffing inpatient units on the basis of patient census.

- *Staffing patterns*. Staffing patterns refer to the mix or ratio of professional to nonprofessional nursing personnel for a specific nursing unit, nursing service, or facility. To a large extent, this term is a refinement of the specification of staffing levels in that a more detailed indication of skill levels is provided; in many studies, staffing patterns refer to the configuration of nursing personnel, such as the number of registered nurses, licensed practical nurses, and aides required to respond to the care needs of a given patient population.

- *Organizational modes*. This term is often used to describe the manner in which patients or care activities are distributed among nursing personnel. In general it refers to the administrative structure in the operation of a nursing unit for the delivery of nursing care. It is sometimes used interchangeably with the term, nursing assignment patterns.

- Staffing methodology. The term staffing methodology implies a formal mechanism or systematic procedures used to determine the number or mix of nursing personnel that are required to provide a predetermined standard of quality of care to a specified patient population. Staffing methodologies usually encompass an integrated process of assessment and classification of patients; allocation, assignment, and scheduling of nursing personnel; and an evaluation or monitoring of the services rendered.

Three additional terms referred to in the preceding are often encountered in the nursing research literature: allocation, assignment, and scheduling. These terms have precise meanings derived from the operations research, management science, and industrial engineering approaches that underly most studies of nurse staffing. They are essentially hierarchical in nature, and imply the application of quantitative models or techniques such as mathematical programming. As noted in Chapter 1, the first use of such techniques was suggested by Wolfe and Young (1965a,b); they have since been widely used for the study of nurse staffing requirements for both hospitals and individual nursing units (Shuman, Speas, and Young 1975).

- Allocation. At the highest level in the hierarchy of staffing models are those dealing with the allocation of nurse staffing resources. The term allocation may encompass both staffing levels and staffing patterns in that both total hours of staffing time and the mix of professional and nonprofessional personnel are prescribed. Often, allocation is a method for obtaining the optimal mix of skill levels, while minimizing cost or maximizing measures of quality in the delivery of services for a patient population categorized or classified according to care needs. For a nursing service administrator, allocation models are most useful for determining budgeted positions, and for specifying an appropriate configuration or mix of nursing personnel within or among nursing units in the facility.

- Assignment. Assignment models or techniques attempt to assign specific skill levels to particular care activities. As a more refined or detailed variant of an allocation model, an optimal assignment pattern is one that matches available, and often constrained, portions of nursing time with essential care activities for a patient population whose care needs have been indicated. As with allocation models, assignment models often seek to minimize the costs of nursing services or maximize some measure of quality such as the appropriateness of assignment.

- Scheduling. Within the general framework of allocation and assignment models, scheduling refers to the manner in which nursing staff are scheduled over a time period such as a shift, a week, a month, or longer. A scheduling model often assumes that total staff needs have been prescribed; given available staff, optimal schedules are then required to assure the presence of appropriate nursing personnel, over time, for the delivery of required services.

POINTS OF REFERENCE

The literature search for this monograph proceeded on the realization that

- Two major reviews of the literature, by Aydelotte (1973) and Jelinek et al. (1976), had already been published, both relating to nurse staffing methodologies, and that a third review, by Georgopoulos (1975), provided an excellent synopsis of research on hospital organization and intraorganizational relationships.

- It would be of value to conduct the literature search and assessment within a conceptual framework that delineates variables and parameters associated with the organization and delivery of nursing care. Such a framework can serve as a guide in selecting and abstracting from the literature those studies that have evaluated the effects of factors pertinent to nurse staffing.

Since this monograph, to avoid duplication, will focus primarily on the literature published since 1974, it is of interest to consider briefly the earlier work of Aydelotte, Jelinek et al., and Georgopoulos, who have provided both reference points and conceptual benchmarks for the present review.

EARLIER LITERATURE REVIEWS

Summary of Aydelotte (1973)

In her review of nurse staffing methodologies, Aydelotte clearly set herself six objectives: (1) the development of a glossary of terms; (2) the identification, summary, and critique of the staffing literature; (3) a description and comparison of methodologies used in nurse staffing research; (4) the design of broadly applicable protocols for the literature review; (5) an overall summary of the literature (and any site visits); and (6) the compilation of a bibliography.

The time span of the review covered literature published between 1955 and 1970. Literature was considered relevant to her review if it dealt with the measurement of nursing activities and of patient care requirements, the prediction of nursing staff requirements, patient welfare, nursing personnel welfare, or nursing workload. Within these areas, Aydelotte found hundreds of variables treated more or less rigorously. These variables became the basis for a scheme or framework of the nursing care delivery system and of the forces affecting the system. In this scheme, nursing practice is viewed as evolving from the patient's requirements for care, while the overall nursing delivery system is dependent on many factors in the nursing unit, nursing administration, hospital environment, and community.

Aydelotte found the quality of literature to vary greatly. In many instances, documentation and rationale were deficient, research problems were not clearly stated, and variables were not well defined. The number of variables was found to be overwhelming; frequently, they seemed impossible to describe or quantify adequately. Aydelotte also found only slight agreement in the literature on the content or nature of some of the most basic factors; quality of care, patient needs, complexity of care, intensity of care, and levels of care all were variously defined. Furthermore, after distinguishing four forms of staffing methodologies -- descriptive, industrial engineering, management engineering, and operations research -- she found them all to have serious weaknesses.

Aydelotte concluded that there existed four major categories of problems related to nurse staffing. The first involves the lack of a well developed and universally accepted model of the nursing care delivery system. The second concerns the measurement of patient requirements for care; Aydelotte pointed out that in all patient classification procedures reviewed, the underlying assumption was that the care provided and measured was both necessary and sufficient, but that the validity of this assumption was never proven. Her third category of problems in the literature relates to the measurement of quality, specifically, to the failure of researchers to examine the relationship of nursing activities to patient outcomes. Aydelotte argued that this would require nurse-specific evaluation criteria and a careful selection of those observations that can provide the most useful and pertinent information. The fourth set of problems involves the measurement of nursing activities; particular deficiencies in this area related to sampling, selection of study units, designation of categories of nursing functions, and grouping of task complexes.

Several specific recommendations by Aydelotte led to a conference on research on nurse staffing in hospitals (Levine 1973). Conceptual models of the nursing care delivery system were to be developed in collaboration with nurses knowledgeable about nursing practice and experts from the field of management engineering or operations research. Patient classification schemes based on nurses' perceptions of care should be devised and tested by means of carefully designed studies. Controlled studies assessing the effects of improved support systems on nursing staff requirements should be conducted; such studies should include consideration of the availability and placement of equipment and supplies. A concentrated effort involving above all expert nurse clinicians should be made to establish valid standards for the measurement of nursing quality. Guidelines for the use of each of the four specific staffing approaches -- descriptive, industrial engineering, management engineering, and operations research -- should be developed which would state the rationale upon which each is based, the variables studied, limitations, and the appropriate use of specific staffing methodologies. New methodologies should include far more variables and be based on the conceptual models of the nursing care delivery system called for in her first recommendation. Although Aydelotte did not offer a formal model or framework, it is significant that she identified the need for one and recognized that many variables related to nurse staffing methodologies must be considered in its conceptualization.

Summary of Jelinek et al. (1976)

The Medicus Systems Corporation project, reported in three volumes by Jelinek and Dennis (1976), Jelinek et al. (1976) and Jelinek and Luskin (1976), was designed to evaluate efforts to measure and improve nursing productivity. The investigators examined various definitions of nursing productivity and developed a conceptual framework for classifying the literature. The nursing literature related to productivity was searched and relevant current and recent research on nursing productivity was evaluated. Findings and recommendations were presented at a national conference of leaders in the field of nursing, administration, and education.

Although the Medicus report represents a desirable updating of the 1973 review by Aydelotte, emphasizing as it does literature published between 1970 and 1974, its most significant feature is the conceptual framework presented for a classification of the literature. Also, while the framework was tied to the notion of nursing productivity, much of the literature reviewed inevitably related to staffing methodologies. A major finding of Jelinek et al. was that most studies which have attempted to address the issue of nursing productivity suffer from the lack of an acceptable theoretical framework, resulting at least in part from definitional inconsistencies and from inaccuracies in measuring pertinent factors.

The conceptual framework for nursing productivity devised by the Medicus research team employed an "open system model" similar to those frequently found in the systems engineering literature. It was argued that since productivity can be defined as the relationship between the input and output of a process, a conceptual framework for nursing productivity could be structured in terms of an input, an application of technology, and a resulting output -- all of these being primary factors embedded in an environment or setting that both defines and affects the primary factors. Input, for example, would include manpower and education, nurse identity, kinds of nursing care, and organizational considerations. Technology would include patient classification systems, staffing and scheduling, team/primary nursing modalities, care planning, administration, leadership and supervision, and a host of other factors related to methodologies, devices, analytical approaches, organizational structure, administration, and management. Output factors were categorized into those reflecting quality and quantity of care, including effectiveness and cost, and those reflecting nursing attitudes, such as job satisfaction, turnover, absenteeism, and patient relations. Finally, environmental factors were to include personnel factors such as motivation, interprofessional relations, and nursing philosophy, as well as contextual factors such as delivery of care, economics, collective bargaining, and research.

Like Aydelotte, Jelinek et al. found the literature related to nursing productivity to be of uneven quality and many of the studies to be poorly designed and executed. Especially in earlier studies during the period reviewed, objectives were not clearly stated, and methodologies and analyses appeared inadequate, so that their results could at best be interpreted as suggestive. For each of the productivity-related subject areas within their framework, Jelinek et al. offered recommendations for productivity improvements which included both organizational and operational changes. Perhaps most significantly, the Medicus report called for the integration of knowledge of nursing into a single unified model which could be used to study the interrelationship of the many facets of nursing that have so far largely been studied in isolation. It was felt that many benefits for nursing would accrue from the use of a coherent framework for considering nursing productivity.

Summary of Georgopoulos (1975)

It is important for the purposes of this monograph to recall that Aydelotte (1973), after an extensive review of the literature, called for a theoretical framework of nursing care and nurse staffing methodologies; subsequently, Jelinek et al. (1976) proposed a definitive framework that in part responded to these concerns. It is of interest, also, to examine the work of Georgopoulos (1975), which was related to hospital organization in general, and to nursing organization in particular.

The primary objectives of this exhaustive compilation and synopsis of the empirical research on hospital organization and intraorganizational relationships were to identify and examine, in a systematic fashion, the large body of existing literature and to evaluate this literature in terms of its quality and quantity. The focus of the review was literature published from 1960 through 1969 on organizational effectiveness, coordination and integration, allocation of organizational resources, systems maintenance, change and adaptation to the external environment, and intraorganizational strain. Within these broad conceptual areas, over 20 specific topics were explored, including nursing performance, nursing organization, work relations, staffing patterns, and a variety of other topics related to nursing.

As an aid to his efforts, Georgopoulos developed a content analysis framework with 15 descriptive headings for evaluating each piece of hospital organization literature. Within this framework, studies were classified according to setting, design, data collection instruments, dependent and independent variables, and quality. Although this framework was less formal a model of the nursing process than the Medicus model, its structure nevertheless enabled an identification of variables or factors affecting nursing organization and the delivery of nursing services, and it was used to indicate areas where further research was needed.

Georgopoulos found that hospital organization research has consisted primarily of surveys and has included few experimental or quasi-experimental designs for conducting more rigorous research. The best studies tended to be cross-organizational comparisons, while the poorest were those using a case study approach. An interesting and most significant finding was that the quality of the research reviewed appeared to decline during the decade under study.

A FRAMEWORK FOR REVIEW

Aydelotte (1973), Jelinek et al. (1976), and Georgopoulos (1975) all presented persuasive arguments on behalf of a theoretical framework for conducting a systematic review and critique of the nursing literature. Aydelotte proposed a somewhat generic framework for considering nurse staffing methodologies; Jelinek et al. developed a systems model of the nursing process for reviewing nurse productivity; and Georgopoulos suggested a content analysis framework for evaluating hospital organization literature.

In her review of the literature, Aydelotte in particular found that staffing methodologies have often depended on unidimensional measures that ignored the interrelationships among key variables. In other words, staffing methodologies have frequently been developed and implemented without regard for the larger context within which the nursing process occurs. In considering those factors that might significantly affect staffing methodologies, therefore, it becomes crucial to employ a conceptual framework that portrays nursing as an organizational system responsive to patient demands but affected by a variety of controllable and uncontrollable factors, some of which may be neither identifiable nor measurable.

For purposes of this monograph, it was felt that the framework, or model, proposed by Jelinek et al. offered the best possibilities for adaptation; essentially, it viewed the nursing process as being composed of four key components -- input, technology, output, and environment -- as shown in Figure 1. Geared primarily to the notion of nursing productivity, this model postulated an input that was acted upon by technological processes in order to produce an output. It was assumed that in such an open system model interaction with the environment may and does occur; environmental factors may therefore modulate the process and ultimately the output.

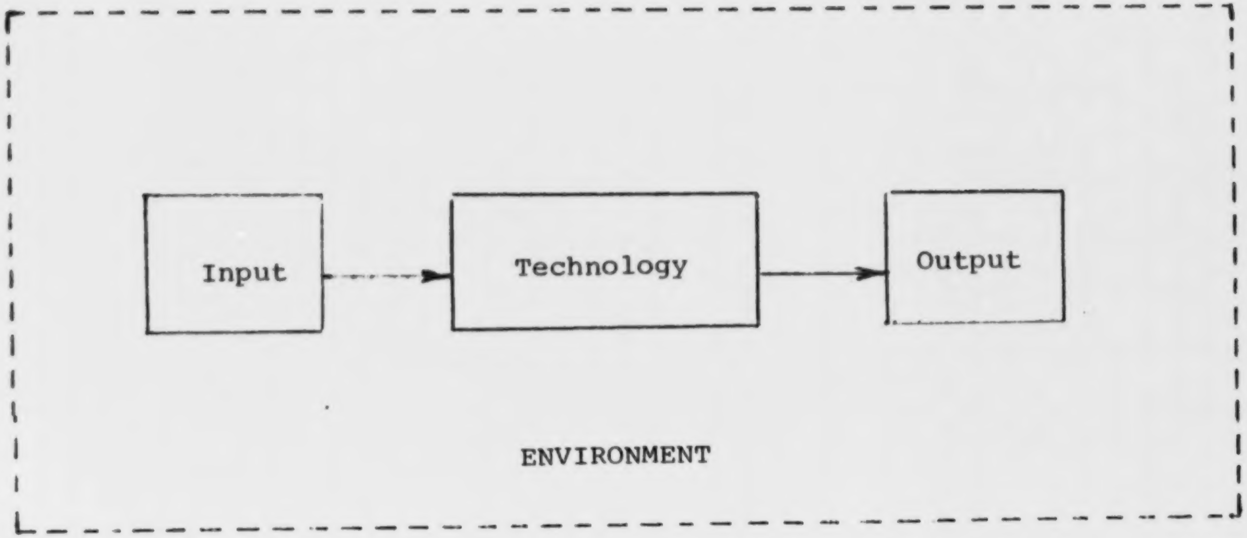
Input
Technology
Output
ENVIRONMENT

FIGURE 1
Nursing Productivity Framework. Adapted from Jelinek et al. (1976)

With regard to an input-output model of productivity, particular attention was devoted to those factors that would increase the ratio of output to input.

In contrast to the Medicus focus on productivity, however, the present monograph is concerned with the more general concept of staffing methodologies as a means for responding effectively to highly variable patient needs. It is also concerned with the organizational mode within which care activities are provided. Many factors may affect staffing methodologies and their effective implementation; these factors must be considered within the context of the nursing care modality that obtains. Some modification of the Medicus model was therefore necessary, as well as considerably more detail as to what variables might be included in each component. The general aim was to have available a conceptual framework for delineating variables and paramenters associated with the organization and delivery of nursing care that would enable

- The identification of factors that affect staffing;
- The delineation of interrelationships among such factors; and
- The isolation and identification of those factors that have been insufficiently investigated or neglected entirely.

The framework shown in Figure 2 was thus developed both as a model for portraying the nursing care process and as a means for a comprehensive review of the literature on factors affecting nurse staffing. The framework is similar to that of Figure 1 in that it depicts the nursing care process in terms of an organizational system with inputs and outputs, acted upon by intervening operational factors and influenced by environmental factors.

Input

Input to the nursing care process consists of those factors that must be acted upon in order to produce an output. Fundamentally, this includes nursing manpower and the patients to be cared for. However, as an input factor nursing manpower must be thought of in terms of budgeted positions, the particular mix of professionals and nonprofessionals, the availability of personnel, required educational and skill levels, and the motivations and attitudes brought to the care process. Any changes or variation in these factors will enhance or constrain the aggregate of the resources for providing care.

Patients, the focal point of the care activities, must be considered in terms of their needs or the levels of care to be provided. Overriding both personnel and patient factors are the prevailing philosophy of nursing that is adhered to and the policies in effect for carrying out nursing functions and implementing goals.

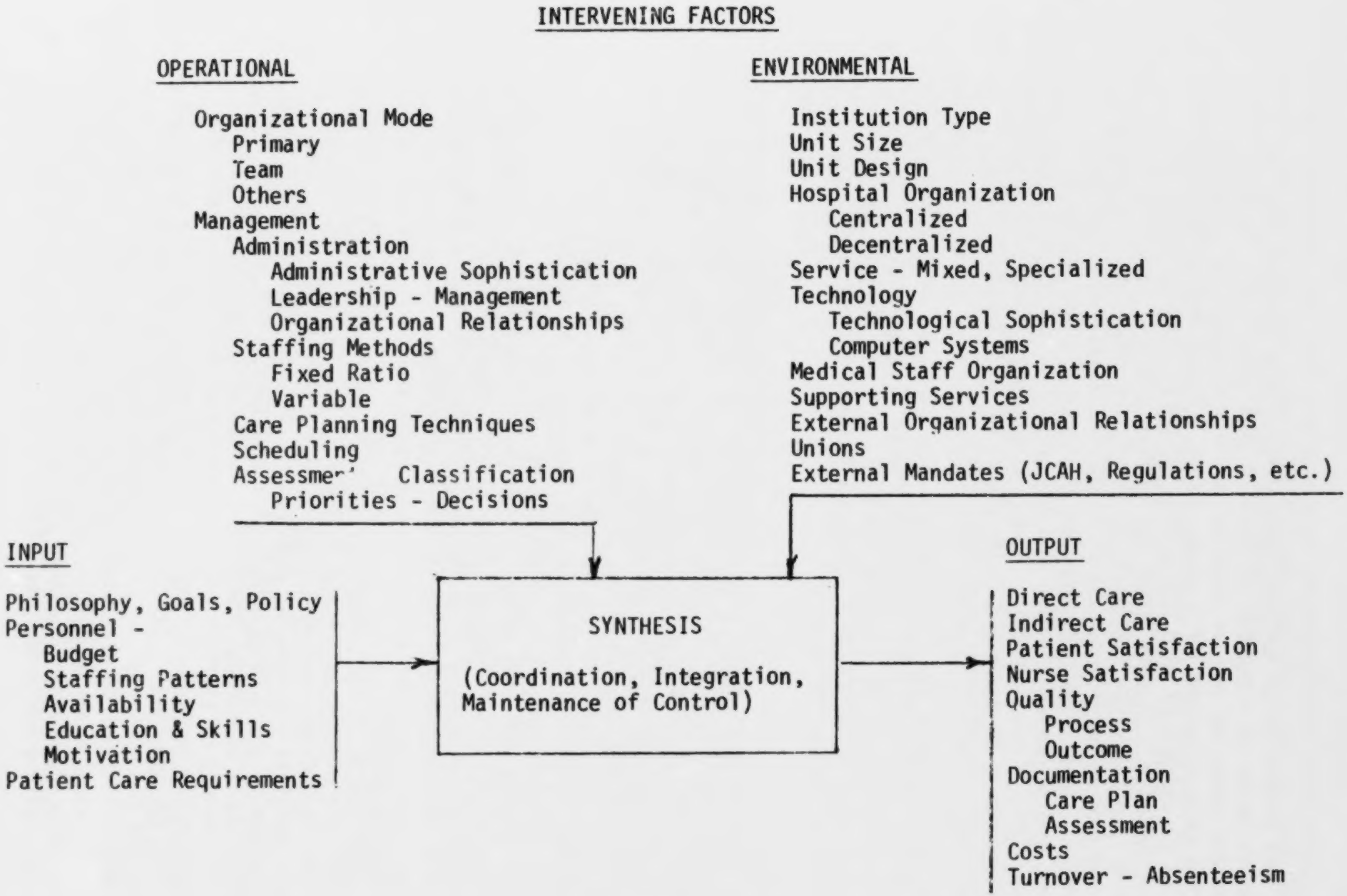
INTERVENING FACTORS
OPERATIONAL
Organizational Mode
Primary
Team
Others
Management
Administration
Administrative Sophistication
Leadership - Management
Organizational Relationships
Staffing Methods
Fixed Ratio
Variable
Care Planning Techniques
Scheduling
Assessment - Classification
Priorities - Decisions
ENVIRONMENTAL
Institution Type
Unit Size
Unit Design
Hospital Organization
Centralized
Decentralized
Service - Mixed, Specialized
Technology
Technological Sophistication
Computer Systems
Medical Staff Organization
Supporting Services
External Organizational Relationships
Unions
External Mandates (JCAH, Regulations, etc.)
INPUT
Philosophy, Goals, Policy
Personnel -
Budget
Staffing Patterns
Availability
Education & Skills
Motivation
Patient Care Requirements
SYNTHESIS
(Coordination, Integration, Maintenance of Control)
OUTPUT
Direct Care
Indirect Care
Patient Satisfaction
Nurse Satisfaction
Quality
Process
Outcome
Documentation
Care Plan
Assessment
Costs
Turnover - Absenteeism

FIGURE 2

A Framework for the Review and Critique of Literature on Factors Affecting Nurse Staffing in Acute Care Hospitals

Output

The output to be derived from the nursing process may be stated in terms of a number of more or less measurable factors. Immediate measures can be obtained as to the amount of direct or indirect care provided for a given input. These measures are often said to be correlated with the quality of care, considered as an output measure. Quality itself has proven difficult to quantify, however, and is often indicated by surrogate measures of process and outcome or by documentation of patient assessment and care planning. Other indirect measures of output include levels of patient and nurse satisfaction and the extent of turnover or absenteeism within a nursing unit. Used in isolation, these measures have proven to be somewhat insensitive, often misleading, and usually confounded with other measures.

For some, the ultimate output measure is the costs of nursing care. Obviously, costs are only meaningful when compared to the care delivered; attempts to minimize the costs of nursing care for an assumed level of quality are rendered suspect by the difficulties inherent in measuring quality.

Synthesis

Input must be acted upon to produce a required output. This requires the synthesis or integration of several interrelated processes and their coordination and control. These processes are basically those of patient assessment and classification, care planning, the allocation or assignment of nursing staff, and the evaluation of the care provided by means of quality audits. This is, in fact, the heart of the nursing process as proposed by Aydelotte (1973) and represents the application of technology to convert input to output as suggested by Jelinek et al. (1976). This synthesis does not occur, however, within a closed system. Rather, we are faced with an open system where the synthesis is influenced by a host of intervening factors; these may be separated into operational and environmental factors.

Operational Factors

Operational factors generally include those methods that govern or affect the way in which the process of synthesis is carried out in order to convert available input into a desired output. These factors comprise the specific procedures and techniques underlying the translation of nursing philosophy and policy into practical and effective daily operating practices. Fundamental to this process are the variety of staffing methodologies that may obtain, and the techniques for patient assessment, classification, and care planning that may be employed. Obviously, these operational factors exist within the framework of an organizational mode for nursing care, and are influenced by the administrative sophistication of both nursing and hospital management. As noted earlier, staffing methodologies and organizational modes interact; one cannot implement specific staffing methodologies without a consideration of nursing care modalities, nor can one decree an organizational mode without a consideration of available staff and the methods used to allocate nursing personnel to indicated care activities.

Environmental Factors

Nursing care is inextricably dependent on the environment in which nursing activities take place. In contrast to operational factors, environmental factors may be largely uncontrollable and for the most part may be unmeasurable, even under the best of circumstances. Although it is intuitively clear that institutional type and hospital and medical staff organization both dictate and constrain the nursing care process, the effects of differences in these factors are extremely difficult to quantify. The influences of external organizational relationships and the impact of external mandates, such as JCAH guidelines and federal or state regulations, are equally difficult to assess or control. On the other hand, deliberate decisions may be made concerning a hospital's organizational structure or the introduction of technology; in many instances these kinds of decisions can be based on a thorough evaluation of the costs and benefits to be realized from any changes that are implemented.

REVIEW OF THE LITERATURE

The overall aim of this monograph is a review and critique of the literature on factors affecting nurse staffing. In the framework presented in Figure 2, the most important factors have been delineated and categorized as input, operational, environmental, or output factors. Clearly, some factors placed within one category could equally well have been placed within another, depending on one's point of view or the definition of the factors. For example, specific patient classification procedures practiced within a given facility might normally be considered an operational factor in their effects on nurse staffing patterns. For purposes of this monograph, however, it was felt that patient care requirements, an input, were generally reflected by patient classification as a measure of the level of care needs or required nursing care activities. For this reason, patient classification systems are considered an input factor in this review. Similarly, administrative sophistication and leadership styles, together with organizational relationships, although listed as operational factors, may in some instances be classified as environmental factors, depending on one's perception of their role. To this extent, the categorization of factors in Figure 2 must not be taken as immutable; modifications are possible and may be desirable for particular purposes.

Nonetheless, it was found that the conceptual framework as structured in Figure 2 served as an effective guide to a critique of the state of the art of factors affecting nurse staffing. It must be noted that although many factors are indicated, only a small number have been addressed in the literature in terms of their impact on nurse staffing. As a case in point, a large body of literature exists concerning many of the environmental factors, but very little of this literature has been devoted to an evaluation of their implications for nursing care or nurse staffing. As a result, the review has focused primarily on those factors that have been considered in the literature in a manner relevant to this monograph.

In general, the conclusions reached by Aydelotte (1973) and by Jelinek et al. (1976) still hold. Many of the factors in the framework acknowledged as important for nurse staffing have remained ignored; the research literature has tended to concentrate on one or two factors in isolation, without assessing the potential interaction with, and the effects of, the many other factors in the framework. This indicates a crucial need for extensive future research. Also, the majority of the studies reviewed lacked rigorous experimental or research designs, were inadequately controlled, and failed to consider tests of the reliability and validity of the instruments used.

Particular attention was devoted to literature assessing the potential impact of the movement toward primary nursing care as an organizational mode for inpatient nursing. It was found that the literature on primary nursing care was largely descriptive, and that the little research which has been done has often been conducted without sufficient attention to methodological issues. Also, the extensive research over the past two decades on the effects of patient classification and staffing methodologies on patient care activities using team nursing has not been carried over to primary nursing care; there have been few valid studies or measurements of what primary nurses do, or of the effects of primary nursing care organization on direct patient care. Obviously, further research on primary nursing is needed.

Chapter 3

METHODS OF REVIEW

A conceptual framework was developed which represents nursing as an organizational system with inputs and outputs, acted upon by operational factors and influenced by environmental factors. This framework, which is described in Chapter 2, was used as a basis for a review of the literature on factors affecting nurse staffing in acute care hospital settings. Literature on the following topics in the framework was reviewed:

- Input Factors (Personnel and Patient Requirements)
  - Educational Preparation of Nurses
  - Nurse Staffing Patterns
  - The Use of Part-time and Agency Personnel
  - Patient Care Requirements
- Operational Factors
  - Nursing Service Organization
  - Unit Management
  - Scheduling
  - The Modified Work Week
  - Organizational Modes of Nursing
- Environmental Factors
  - Unit Design
  - The Use of Computers
  - The Unit Dose System

Literature on output factors was not specifically reviewed as they do not directly affect nurse staffing. Output factors represented in the framework were considered only when they were discussed as the dependent variables or outcomes of studies of input, operational, or environmental factors.

SEARCH AND SELECTION OF THE LITERATURE

The present review focuses primarily on the literature published from 1974 through 1979. In part, it can be considered an update of the reviews by Aydelotte (1973), who surveyed the literature on nurse staffing methodologies between 1955 and 1970, by Georgopoulos (1975), who surveyed hospital organization research from 1960 to the end of 1969, and by Jelinek et al. (1976), who examined literature on nursing productivity from 1970 to 1974. Material published prior to 1974, however, has been included in the present review when it was felt that it had not heretofore received sufficient attention or that a different interpretation of the work was required for the present purposes. Also included are those works considered classic studies in their field. It should be noted that only articles and reports in English were selected for review. The vast majority of the literature obtained relates to nursing in the United States, although a small number of studies and reports from Canada, Great Britain, and other English speaking countries was obtained.

The literature search used methods similar to those employed by Aydelotte, Georgopoulos, and Jelinek et al. Abstracts, indices, and recent journal issues were searched, and literature recommended by experts in the field was obtained as well. The following indices and abstract compilations were searched:

Abstracts of Health Care Management Studies
Abstracts of Hospital Management Studies
Cumulative Index to Nursing and Allied Health Literature
Dissertation Abstracts International
Hospital Literature Index
Index Medicus
International Nursing Index

Also, all issues of the major nursing journals were scrutinized for the period 1970-1979, as were relevant journals from related fields such as health care research, hospital administration, computer technology, and hospital pharmacy. As each work was obtained, its bibliography was scanned for additional, probably pertinent works. A list of journals which yielded relevant literature is given in Table 1. Literature on factors affecting nurse staffing in acute care settings was found primarily in these and related journals; in addition, doctoral dissertations, books, monographs, newspaper articles, and unpublished reports were reviewed wherever possible.

REVIEW AND CRITIQUE OF THE LITERATURE

All works which were pertinent to the conceptual framework and which could be located were reviewed, summarized, and critiqued, for a total of roughly 475 works. Articles and reports which were obtained but subsequently found not to be relevant to nurse staffing and to the framework of this review were not formally reviewed. In several instances, however, articles on topics related to the framework are briefly described despite their lack of relevance to acute care inpatient nurse staffing. Since these articles were usually obtained because their titles suggested relevance, it was felt that it would be helpful to the reader to mention them so as to provide as complete a review as possible on each topic in the framework.

It should also be noted that some articles and reports are reviewed in more than one chapter or section of the monograph because they dealt with several of the input, operational, or environmental factors affecting nurse staffing which are the scope of this review.

TABLE 1

A Listing of Nursing and Health Care Journals Which Yielded Relevant Literature on Nurse Staffing Issues

Administrative Science Quarterly
American Journal of Hospital Pharmacy
American Journal of Nursing
AORN Journal
ARNJ (Association of Rehabilitative Nursing Journal)
Canadian Hospital
Canadian Journal of Hospital Pharmacy
Canadian Nurse
Communicating Nursing Research
Computers and Biomedical Research
Dimensions in Health Services
Georgia Nursing
Health Care Week
Health Services Research
Hospital Administration
Hospital Administration in Canada
Hospital and Health Services Administration
Hospital Pharmacy
Hospital Progress
Hospital Topics
Hospitals
Impetus
Inquiry
Interfaces
International Journal of Nursing Studies
International Nursing Review
Journal of Advanced Nursing
Journal of the American Association of Nephrology Nurses and Technicians
Journal of Continuing Education in Nursing
Journal of Neurosurgical Nursing
Journal of Nursing Administration
Journal of Nursing Education
Journal of Psychiatric Nursing
Journal of Thoracic and Cardiovascular Surgery
Military Medicine
Modern Health Care
Modern Hospital
Nursing Administration Quarterly
Nursing Care
Nursing Clinics of North America
Nursing Dimensions
Nursing Forum
Nursing Outlook
Nursing Research
Nursing Research Report
Nursing Times
Nursing '75-'79
Research in Nursing and Health
RN
Supervisor Nurse

CLASSIFICATION OF REVIEW MATERIAL

In order to assist the reader in determining the depth and methodological focus of each work and in evaluating the validity of its conclusions, articles and reports were classified wherever feasible into three broad categories based on their level of complexity, i.e.,

Purely descriptive writing;
Descriptive-evaluative works; and
Research reports.

It was felt that this would be the most suitable approach in a source book on the nurse staffing literature, particularly since it appeared that previous reviews related to nurse staffing, especially the Medicus report (Jelinek et al. 1976), made it difficult to determine whether citations were of full research reports or merely brief descriptive articles, and whether conclusions were based on carefully executed research or on the authors' impressions and opinions.

The first category represents purely descriptive literature, usually subjective and anecdotal in style, and tending to describe personal views or experiences. Although specific outcomes or results of programs or innovations were sometimes mentioned in these articles, these were not based on data collection or on other objective means of evaluation. In addition to such case studies, articles presenting definitions, historical reviews, and philosphical discussions of concepts were included in this category and summarized in Chapters 4 to 8 as to purpose, content, and conclusions. These articles are rarely discussed in detail.

The second category, a combination of descriptive and evaluative approaches, includes literature that was primarily descriptive but presented some objective results. However, the theoretical framework, research design, methods, and analysis procedures used in these evaluations appeared generally weak and were rarely described in enough detail to permit a full critique of methods and results. This literature was summarized with respect to purpose, content, and conclusions; in addition, evaluation findings are presented briefly, without detailed discussion of the validity and significance of results.

The third, and for purposes of this review most important, category represents reports of systematically conducted research on factors affecting nurse staffing in acute care hospitals. These reports included enough information on the methods employed for an adequate critique of research processes and outcomes. The format used to classify, review, and critique literature in this category is shown in Table 2.

In several instances an article considered purely descriptive in one section of the review is considered as a descriptive-evaluative

TABLE 2

Methodological and Substantive Aspects and Questions in the Review and Critique of the Literature

Review

- Methodology
  - Hypotheses/Research Questions
  - Independent Variables
  - Dependent Variables
  - Other Study Variables
  - Research Design
  - Study Population
  - Sampling Techniques
  - Data Collection: Instruments; Reliability and Validity
  - Data Analysis
- Findings and Conclusions
  - Findings
  - Limitations (as stated by author)
  - Conclusions (as stated by author)
  - Recommendations (as stated by author)

Critique

- Is there a theoretical or conceptual framework?
- Are independent and dependent variables defined?
- Is the research design adequate?
- Was the study population selected appropriately?
- Are sampling techniques specified?
- Are characteristics of the study population given?
- Are the reliability and validity of instruments addressed?
- Is analysis of data adequate?
- Do the conclusions relate to the dependent variables?

or research study in another section. This distinction was made when a single article presented both a purely descriptive discussion of one topic in the conceptual framework and evaluation or research results relating to another topic.

PRESENTATION OF RESULTS

Chapters 4 to 8 present results of the literature review and critique. Chapters correspond to major categories in the conceptual framework (see Figure 2) and are divided into sections corresponding to specific subjects related to nurse staffing in acute care hospitals.

Each literature review section has a brief introduction in which findings from previous reviews on the subject by Aydelotte (1973), Georgopoulos (1975), and Jelinek et al. (1976) are discussed where appropriate, and definitions and the history of concepts and nursing developments are given. The literature on the topic is then discussed in order of complexity: first the descriptive literature; then the descriptive-evaluative literature, together with a brief summary of evaluation results; and finally the research literature, with a detailed review and critique provided for each major study. In the reviews of the research literature, an effort was made to discuss the body of material on each topic from the same point of view. Thus each chapter and section provides fairly standard commentary on research questions, study variables, research design, study populations, data collection and analysis methods (with $p \leq .05$ as the level of statistical significance unless otherwise noted), findings, and conclusions.

Two listings of the works included in this review are provided for reference. One is in alphabetical order by author (Appendix A) and one is subdivided by the subject areas which are the scope of this review (Appendix B). In the reference list divided by subject areas, the review category to which each work was assigned is designated by a letter after the full reference, i.e.,

D for descriptive literature,
D-E for descriptive-evaluative literature, and
R for research literature.

Secondary references from the literature which are mentioned in the text, such as references to evaluation instruments used in specific studies, are shown in Appendix C. It should be noted that these were not verified for the purposes of this review.

LIMITATIONS OF THE REVIEW

Several limitations to the methods used in the literature review are acknowledged. A major limitation concerns its completeness. Although every effort was made to obtain all recent published and unpublished literature on factors affecting nurse staffing in hospitals, there is no doubt that some relevant works were missed. Much of the unpublished literature of interest and relevance to the conceptual framework could not be included because of difficulties in obtaining unpublished materials mentioned in the bibliographies of articles and reports. Since these articles and reports were often several years old, the project staff was frequently unable to locate the author of the article or of the unpublished work cited. Difficulties were also encountered in obtaining copies of unpublished doctoral dissertations and other reports cited in the various abstract compilations. Except in the few instances in which authors could be approached directly, these reports could be obtained only by purchasing microfilm or duplicate copies. Since the cost of purchasing a large number of reports was prohibitively large, only the most recent unpublished works with clear relevance to the framework and nurse staffing issues were obtained. For the same reason, a number of the reviews and critiques in this monograph were based on summary articles for which the full report could not be obtained. It is acknowledged that this may have led to misunderstandings of the methods used or to misinterpretation of findings as presented in summary articles.

Another study limitation relates to the framework used as a basis for the literature search. For a number of topics in the framework considered important for issues of nurse staffing (see Figure 2), nothing was found in the literature. No specific recent literature could be located on input factors such as general nursing philosophy, goals and policy, personnel budget, and personnel motivation, operational factors such as administrative sophistication, leadership, care planning techniques, and data collection procedures; and environmental factors such as institutional type, service, medical staff organization, external organizational relationships, unions, and external mandates. It is recognized that the inability to locate pertinent articles does not imply that these aspects have never been studied or discussed. For one, articles may have appeared in relevant journals unknown to the reviewers; also, the difficulty of formulating proper descriptors for abstract and index searches and the inaccessibility of imprecisely titled articles in these sources may have caused inadvertent omissions.

INPUT FACTORS:
PERSONNEL AND PATIENT REQUIREMENTS

In the conceptual framework in Figure 2, input to the nursing care process was depicted as consisting of those factors that must be acted upon in order to produce an output. The most basic input factors are, of course, personnel and patients. The manner in which each of these affects staffing methodologies is complex and, as it turns out, incompletely studied or understood. Intuitively, it is clear that staffing is constrained by budgeted positions, manpower availability, educational levels, and motivation for providing care; variations in these factors will dictate both the staff resources that can be aggregated and the procedures that can be implemented in particular nursing care settings. Patient care requirements will also stipulate the care activities that must be carried out; in most instances these requirements are indicated by means of patient assessment and patient classification. Superimposed on both personnel and patient factors are the prevailing philosophy of nursing and the policies in effect for achieving the goals of nursing practice.

As will be seen in Chapters 4 and 5, little has been found in the literature that relates philosophy of nursing or nursing goals and policy specifically to nurse staffing methodologies. This is an area that needs a great deal of further research, especially if the organizational mode of nursing, such as primary or team nursing, is viewed more in terms of a philosophy of nursing than as an administrative structure.

Personnel and patient factors have been considered more or less rigorously in the literature. Regarding the former, it was found that education, staffing patterns, and the use of part-time and agency personnel have received the greatest attention in the literature; these factors are discussed in Chapter 4.

Among patient factors, care requirements as reflected by patient classification systems have received intensive study. Because of this, Chapter 5 is devoted entirely to the literature on patient classification systems and their effects on staffing methodologies.

It was generally found that most of the input factors have been inadequately studied. Where there has been a great deal of research, as for example in patient classification, the relationships of input factors to operational or environmental factors have often not been considered. Perhaps most important, thorough evaluations of the effect of input factors on staffing for primary nursing are rare or confined to settings from which it is difficult to generalize.

Chapter 4

INPUT FACTORS: PERSONNEL

EDUCATIONAL PREPARATION OF NURSES

The differential educational preparation of nurses is an input factor to the nursing process which is indirectly related to issues of nurse staffing. The purpose of this section is to review the recent literature on educational levels of nurses which is most relevant to these issues. In general, the literature is extensive on subject areas such as the controversy over minimum degree requirements for professional nursing practice and the technical-professional nursing dichotomy. This literature is not treated here, nor is that on the clinical specialist and nurse practitioner (see, for example, DHEW 1978), since it is of little relevance to inpatient staffing. Rather, the focus is on the recent literature comparing graduates (or graduating seniors) of the three types of existing educational programs with regard to their clinical performance and other performance related variables. The three types of registered nurse programs are diploma (hospital-based), associate degree (community college-based) and baccalaureate degree (university-based) programs. The number of three-year diploma programs, which were the only sources of professional nursing education in the early part of the century, has decreased over the last several decades, while the number of four-year baccalaureate programs has increased steadily since 1950. By the mid-1970s, 30 percent of nursing students were enrolled in diploma programs, 44 percent in associate programs and 26 percent in baccalaureate degree programs (Scott and Levine 1976).

Two literature reviews useful for present purposes are in the areas of education and performance, i.e., Schwirian (1977) and Dennis and Janken (1979). The reviews by Georgopoulos (1975) and Aydelotte (1973) did not focus specifically on the literature on education of nursing personnel. The Medicus report by Jelinek et al. (1976) included summaries of several articles on this subject which suggested that educational background affects practice and quality of performance. Jelinek et al. also recommended that further research be conducted with the goal of reducing the disparity between the expectations of nursing graduates and the reality of their work.

DESCRIPTIVE LITERATURE

The descriptive literature on educational levels contains a number of articles focusing specifically on the associate degree nurse. Within this category there are two articles that are representative of the general literature on the associate degree nurse and have some relevance to nurse staffing.

Beverly and Junker (1977) expressed their views as nursing service administrators and discussed the competence of the recent associate degree graduate in the hospital setting. The authors pointed out that the new associate degree graduate who has no prior experience as a licensed practical nurse has very limited clinical exposure, and this "represents a constraint when it comes to matching nursing resources with program goals" (p. 515). Other deficiencies in new associate degree nurses were difficulties in establishing priorities and making judgments, in collaborating with other health team members, and in caring for more than one patient at a time.

A similar view of the abilities and appropriate utilization of the associate degree graduate was taken by Rotkovitch (1976). Writing as a nursing administrator, Rotkovitch said that she needed associate degree graduates, but only to fill roles for which they have been prepared. She believed that new associate degree graduates could improve skills and competence with good orientation and guidance from baccalaureate and master's degree nurses. Rotkovitch felt strongly, however, that they should not function as medication nurse for a unit, charge nurse on evening and night shifts, or primary nurse, because they were not prepared for these roles. The author, an advocate of primary nursing, believed that the associate degree nurse should become the assistant to the primary nurse, and that the baccalaureate degree should be the minimum requirement for professional nursing practice. The observations made by Rotkovitch and Beverly and Junker were common in the nursing literature; although unsubstantiated by data, they clearly have potential implications for nurse staffing.

Several recent articles in the descriptive literature made more explicit comparisons among nurses from the different educational programs. Michelmore (1977), for example, while acknowledging difficulty in distinguishing most associate degree and baccalaureate degree curricula, described the differences in the associate degree and baccalaureate degree programs at Gwynedd-Mercy College, Pennsylvania. She found the major difference between the two programs in what their graduates knew, rather than in what they did or where they did it. Michelmore explained that associate degree graduates were expected to use basic nursing knowledge in planning and giving direct care in supervised settings, and were prepared to deal with problems having fairly well known solutions. Baccalaureate graduates, on the other hand, provided leadership in the delivery of direct and indirect care and should be prepared to handle problems with relatively unknown solutions.

An unsuccessful effort to distinguish different roles for associate and baccalaureate degree nurses in the practice setting was described by Price (1972). A one-year pilot project was to develop roles based upon educational preparation, to improve patient care through improved utilization of nurses, and to increase job satisfaction and morale. Although some aspects of the project were considered successful, the goal to establish two distinct but complementary roles for associate degree and baccalaureate degree graduates was not met. The author concluded that distinction between "technical" and "professional" nursing roles in the educational institutions does not necessarily carry over to the practice setting.

A comparison of nurses by type of education by Johnson (1966) discussed the differences between professional (baccalaureate degree) and technical (diploma and associate degree) nurses in knowledge and skills. The author believed that a marked difference in patient care by education would be observed if baccalaureate, associate degree, and diploma nurses were compared in situations in which each group used its knowledge and skills to the fullest. Johnson concluded that the competence of the technical nurse is well recognized and rewarded, but that changes in nursing service must occur for the competence of the professional nurse to be fully utilized.

In summary, the descriptive literature on nurses' educational levels contained articles on the limitations of associate degree nurses, their appropriate functions, and role differentiation among associate degree, diploma, and baccalaureate degree nurses. The relevance of these educational issues to nurse staffing was implicit rather than explicit.

RESEARCH LITERATURE

The research literature was divided into three categories: studies of perceptions of performance, of more objective measures of performance, and of performance-related variables.

Perceptions of Performance

There is a fairly extensive body of research literature on the subject of nurses' educational levels. A large portion of these studies were surveys of the perceptions of nursing directors, supervisors, and staff nurses of the performance of new graduates and more experienced nurses according to educational preparation. These surveys ranged from very informal data collections with small numbers of respondents to more rigorous and broadly based efforts involving the testing of hypotheses and statistical analysis. It should be noted that even the most exacting of these perceptual surveys failed to address issues of instrument reliability and validity.

Hover's (1975) small survey concerning differences in nursing competence by educational level focused on the perceptions of 20 baccalaureate degree nurses, 54 diploma nurses, and 29 diploma nurses who also had some college credits. All respondents had graduated in the five years previous to the survey and worked as staff nurses in one of three hospitals. No statistically significant differences were found in job satisfaction by educational level, although differences were found among levels in attitudes toward physicians, satisfaction with education, career goals, and definition of the characteristics of a good nurse. The finding most relevant to nurse staffing was that as education increased, nurses showed more interest in patient teaching and in the provision of emotional support, greater preference for more physically active patients, and greater willingness to care for patients with different diagnoses.

Cicatiello (1974) described a limited survey with a different respondent population. In this survey, 18 nursing directors were queried about their opinions of associate degree nurses. The majority of the respondents said that associate degree nurses functioned in their hospitals as team leaders or team members. Most directors said that knowledge of nursing theory was the associate degree graduate's greatest strength; weaknesses were insufficient clinical experience to translate theory into action, lack of pharmacological knowledge, inability to handle evening and night duty, and lack of organizational and decision-making skills. The author believed that the associate degree nurse should be a generalist, although with experience some could become specialists. He concluded that the associate degree nurse would be the nurse of the future.

The American Journal of Nursing (1969) conducted a more broadly based survey of nursing directors. In this informal survey, 80 directors responded to questions about differences in orientation programs, work assignments, supervision, charge duties, and salaries among the three groups of registered nurses distinguished by type of education. Approximately half of the respondents said that they made distinctions among the three types of nurses, mainly in terms of what nurses from the different types of programs could not do rather than what they could do. The majority of those directors reporting differences among groups identified the associate degree nurse as needing more orientation, supervision, and limitations in work assignments. In addition, about half said that baccalaureate graduates had the same special needs. In this survey, the recent diploma graduate appeared to be the most desirable.

An exploratory study by Howell (1978) also investigated nursing directors' perceptions of nurses from associate degree, baccalaureate degree, and diploma programs. Using a mail questionnaire sent to nursing directors of all Oregon hospitals (86), Howell obtained data from 50 directors on their opinions of the nurses' technical, process (professional), and overall skills and of the characteristics of the hospital and its nurse population. Skill levels were rated on a three-point scale.

Howell found that the diploma nurse was ranked highest in small hospitals in all skills except the ability to learn new concepts. In larger hospitals, the baccalaureate graduate was ranked equal or superior to the diploma nurse in a number of areas, although the diploma nurse was still ranked highest in some areas. The associate degree nurse was ranked lowest in technical and process skills in both large and small institutions. Thus, in small hospitals, preference was given to the diploma nurse while in larger hospitals the baccalaureate nurse was considered most desirable. Howell concluded that diploma programs were producing nurses valued in both large and small hospitals, that the baccalaureate nurse appeared to be meeting the needs of the larger hospitals, but that the strengths of the associate degree nurse were open to question. According to these directors of nursing, the associate degree graduate lacked the strong technical background which associate degree education claimed to provide.

Reichow and Scott (1976) conducted a survey of administrators' and nursing directors' opinions of new baccalaureate, associate degree, and diploma graduates. Questionnaires were sent to all hospitals and nursing homes in Kansas. Completed questionnaires were returned by 123 (74 percent) of the facilities, although of these only 77 had experience with associate degree and baccalaureate graduates. Respondents ranked the different types of nurses on a scale of one to three with regard to such items as dealing with patients, performing technical procedures, adapting to new situations, leadership ability, and initiative. In all hospitals, the diploma nurse ranked highest, particularly in technical skills. Larger hospitals had a higher regard for baccalaureate graduates than smaller ones. Both types of hospital rated the baccalaureate nurse highest in knowledge of administrative procedures, and equal to diploma nurses in leadership and ability to learn new concepts. The associate degree graduate failed to demonstrate clear areas of strength, except for conscientiousness. Most respondents said that over time, graduates of the three types of programs eventually became equal in ability.

Hogstel (1977) reported a broader survey which involved nurses recently graduated from two associate degree and two baccalaureate degree programs in Texas, as well as nursing directors from a variety of Texas health agencies. Several research questions were posed: Do associate and baccalaureate degree nurses have a different view of the nursing activities they are performing and of their educational preparation for these activities? What differences do nursing directors find in the readiness of associate and baccalaureate degree nurses to practice nursing? Do directors differentiate between the two types of nurses in orientation, position, promotion, salary, and nursing assignments?

A questionnaire was sent to 109 associate degree and 236 baccalaureate degree graduates in staff nurse positions, asking them to report the extent of their performance for each of 80 activities categorized into five basic nursing functions. They were also asked how they perceived their preparation for each activity. Questionnaires were also sent to 100 randomly selected nursing directors, asking them to respond similarly in terms of their employees' performance and preparedness. At least 40 percent of each group responded to the questionnaire.

Chi-square tests and analysis of variance revealed no statistically significant differences between associate degree and baccalaureate nurses in the extent to which they reported performing physical care and technical skills, handling interpersonal relationships, and exercising decision-making and leadership functions. The only clear difference was in community health care functions, which baccalaureate degree graduates performed significantly more often. The baccalaureate graduates felt significantly better prepared in this area while the associate degree graduates perceived themselves to be better prepared than did the baccalaureate graduates in physical care and technical skills. The nursing directors reported that baccalaureate graduates were better prepared at time of employment in four of five nursing functions, but no difference was noted between educational types in ability to perform physical care and technical skill functions. In spite of recognized differences, the majority of the directors said that they did not differentiate between groups in orientation, beginning positions, promotions, or nursing assignments. Hogstel concluded that in spite of the directors' observations that baccalaureate nurses were better prepared than associate degree nurses in a number of areas, they did not in fact provide for using the two types of nurses differently. She therefore questioned the usefulness of having the two different educational programs.

Nelson's (1978) study of nurses' educational levels queried all 1974 graduates of North Dakota nursing programs, and their supervisors, about their perceptions of the graduates' competence in technical, communicative, and administrative skills. A series of null hypotheses was tested which posited no significant difference among: (1) staff nurse perceptions of their competency by educational level; (2) supervisor perceptions of staff nurse competency by educational level; and (3) the respective perceptions of staff nurses and their supervisors regarding staff nurses' competency in technical and communicative skills. A total of 329 graduates from four baccalaureate degree, two associate degree, and three diploma programs (representing a 77 percent response rate) participated in the study, as did 75 percent of their supervisors. Data were obtained with a 38-item Nurse Competency Inventory developed by the investigator, which respondents answered on a five-point Likert scale.

Analysis of variance supported only those null hypotheses positing no significant difference among baccalaureate, associate degree, and diploma nurses and their respective supervisors in perceptions of competency in technical and communicative skills. All other hypotheses failed to be supported, suggesting that as groups, baccalaureate, associate degree, and diploma graduates perceived their degree of competency differently, as did the supervisors of the three different types of nurses. The investigator suggested that nursing faculty and employers consult each other concerning realistic expectations of the competence of the different types of nurses. Additional research was also recommended to determine why some nurses (those from diploma and baccalaureate programs) had different perceptions of their competency than their supervisors.

Overall, review of selected articles from the survey research literature revealed that differences in nurses' educational preparation were indeed recognized by nursing administrators and staff nurses themselves. The implications of these findings, however, are far from obvious. Based on self-reports and perceptual data, they were often obtained without much attention to issues of sample size, sample selection, and response rates. Thus, any conclusions about differences in competence among the different educational levels, and about the relationship of these differences to the issues of nurse staffing, must remain tentative at best.

Measures of Performance

In addition to the perceptual surveys relating educational preparation to performance, several studies attempted to measure differences in performance among groups of study subjects. These represent a more objective assessment of the relationship of type of education to performance.

Waters et al. (1972) conducted an exploratory study with the following objectives: to describe professional and technical nursing as practiced in the clinical setting; to ascertain whether nursing directors in hospitals employing baccalaureate and associate degree nurses observed differences in nursing practice between the two groups;and to determine whether head nurses who supervise baccalaureate and associate degree graduates recognized differences between the two groups.

Twelve hospitals in the San Francisco area were included in the study. From these, 12 nursing directors, 22 head nurses, 24 associate degree staff nurses, and 24 baccalaureate degree staff nurses were selected as study subjects. Sampling techniques used in the selection of hospitals and subjects were not specified. Data were collected by means of interviews with nursing directors and head nurses, observations of staff nurses in the clinical setting, and interviews with staff nurses.

Findings from staff nurse observations of clinical situations and interviews suggested that the actions and attitudes of the associate degree nurses were consistent with technical nursing practice as it was defined in the literature. The actions and attitudes of only 6 of the 24 baccalaureate nurses were judged to be in the realm of professional nursing practice; the practice of the remaining baccalaureate nurses appeared more technical than professional. Findings from the head nurse sample were inconclusive. Head nurses made conflicting statements about whether or not there were differences between the two types of nurses. In general, while they seemed to believe that baccalaureate nurses were more knowledgeable, more observant, and did more problem solving, head nurses did not appear to consider such qualities part of the real work of nursing. Interviews with nursing directors, on the other hand, revealed that directors saw specific differences in the practice of baccalaureate and associate degree nurses. The investigators appeared unwilling to draw conclusions based on these findings, apart from the observation that associate degree nurses were more alike in nursing practice than baccalaureate nurses.

Gray et al. (1977) attempted to distinguish between technical and professional nursing practice in a study set at the University of Vermont School of Nursing. A group of 22 randomly selected students graduating from the baccalaureate degree program was compared with a group of 22 randomly selected students graduating from the school's associate degree program, by means of an essay test based on clinical nursing situations. Although instrument reliability and validity were addressed briefly in the report, the instrument apparently was not tested for these attributes.

Using t-tests and item analysis, the investigators found that baccalaureate students received higher scores on the essay test and more professional points than associate degree students, while the latter received more technical points. Associate degree nurses were mainly concerned with meeting physical needs of patients, while the baccalaureate nurses concentrated on meeting psychological needs. These findings supported the hypothesis that there would be differences in the performance of graduates of the technical and professional nursing programs at the University of Vermont.

Frederickson and Mayer (1977) conducted a similar study of five baccalaureate and three associate degree programs. The problem solving abilities of 28 baccalaureate and 27 associate degree students were tested by means of a film developed by Verhonick et al. (1968) and depicting five typical patient care problems. Students were asked to think aloud and to record their thoughts on tape while viewing the film. All students then completed a standardized test of general problem solving ability. The reliability and validity of the instrument were not mentioned.

Analysis of the examination results by t-tests and analysis of variance revealed that most students in both types of educational programs used three of the four steps in problem solving (problem definition, data collection, solution) and used them in random order;

the final step (evaluation) was used least. No difference was found in the problem solving ability of baccalaureate and associate degree students, although the baccalaureate students tended to score higher on the test. Baccalaureate students were also found to receive significantly higher scores on a standardized test for critical thinking.

The investigators concluded that while baccalaureate students are better at critical thinking in general, they do not use this ability to solve nursing problems. The investigators recommended that these abilities be developed by employers after graduation. They also suggested that, if two levels of nursing practice are in fact to be recognized officially, evidence that two distinct types of nurses exist must be obtained, and educational institutions must begin producing truly different levels of practitioners.

Davis (1972, 1974) included a fourth educational type, the clinical specialist, in an assessment of the relationship of performance to education. In the 1972 study, Davis hypothesized that in a test of observational and evaluative ability, the clinical specialist would list more observations, take more actions, and give more reasons for those actions than the baccalaureate nurse. To test this hypothesis of different levels of performance, 20 clinical specialists and 20 baccalaureate nurses from several institutions and with matching years of experience were shown the film developed by Verhonick et al. (1968) and asked to respond in writing about what they saw and what actions they would take. Although some evidence of the reliability of this instrument was given, no mention was made of its validity.

Analysis of variance, the Mann-Whitney U-test and correlation analysis fully supported Davis's hypothesis. As reflected in reactions to the film, the clinical specialist appeared to perform at a higher level than the baccalaureate nurse, leading Davis to suggest that the clinical specialist should be the nurse responsible for patient care. However, Davis also found for both groups that with increasing years of experience the quality and quantity of care provided by the nurses decreased. She concluded that hospital employment practices should be based on continuing education, not experience.

Davis's 1974 study replicated her earlier study while broadening its scope. She included diploma nurses in the study population and tested two additional hypotheses; i.e., that (1) the clinical specialist would list more observations, actions, and reasons for actions than the baccalaureate nurse, who in turn would list more observations, actions and reasons than the diploma nurse; (2) increased years of clinical experience without intervening education would result in a decrease in the number of actions taken based on observations; and (3) general nursing principles--observation skills, nursing actions, reasons for actions--would not be transferred to or utilized in other areas of nursing. For example, medical-surgical nurses would show more expertise than psychiatric nurses in medical-surgical situations, and psychiatric nurses would have more expertise than medical-surgical nurses in psychiatric situations.

A total of 87 nurses volunteered to participate in the study--27 diploma nurses, 20 baccalaureate nurses and 40 clinical specialists. The subjects were shown the film by Verhonick et al. (1968) used in the 1972 study. Although in this article the instrument was claimed to have been validated by Verhonick, evidence of validity and reliability was not provided.

Regression analysis and the Mann-Whitney U-test confirmed findings from the earlier study. The quality and quantity of clinical specialist care were superior to those of the baccalaureate nurse, which were superior to those of the diploma nurse. Furthermore, the quality and quantity of care provided by all three nursing levels declined with increasing years of experience in the absence of additional education. The third study hypothesis, however, was not supported, in that medical-surgical nurses were rated higher on both medical-surgical and psychiatric nursing functions. Since continuing education, and not experience, appeared to be the determining factor in the quality and quantity of care given by nurses, Davis repeated her earlier recommendation that employment practices should be based on continuing education rather than on experience.

Welches, Dixon, and Stanford (1974) reported on an exploratory study of correlates of nurse performance ratings. In this study, 650 nurses from 15 hospitals in the San Francisco area completed questionnaires including biographical data, an assessment of the work environment, a self-rating of their performance, and a personality inventory. In addition, each staff nurse was evaluated by her head nurse or supervisor on a 19-item rating scale.

From the data collected, the investigators were able to distinguish 12 separate categories (which they called O-types) of nurses. Six clusters of variables were identified which influenced performance: (1) age and experience, (2) intelligence, independent achievement, sensitivity, and flexibility, (3) job satisfaction and opportunity for professional growth, (4) perception of self-performance, (5) social image, and (6) leadership potential and capacity for status. Type of educational preparation did not appear to be related to performance.

Dyer et al. (1972) reported a study of similar scope in which the relationship between job performance and personal, psychological, and administrative factors was examined. In this study, performance ratings of 1,018 nurses from Veterans Administration Hospitals were obtained from head nurses and supervisors, in addition to psychological and other data. Educational level was found to be positively related to performance for two performance instruments used. The authors concluded that this finding and other relationships found in the study should be helpful in selecting and assigning nursing staff and in providing a nursing unit atmosphere which elicits the best efforts of nursing personnel.

A study by Highriter (1969) compared job performance of diploma and baccalaureate nurses. Since it concerned the public health rather than the acute care setting which is the focus of this review, it is discussed only briefly. In this study, nurses were rated by experts who assessed patient progress and identification of family needs in determining the level of care being delivered. Although the supervisors of the public health nurses consistently rated baccalaureate nurses higher than diploma nurses, the investigators found no differences between the two groups on three performance measures. It was concluded that there was no association between level of education and level of performance for any of the nursing care areas studied.

In summary, the research findings on attempts to measure the relationship between nurses' educational preparation and clinical performance were contradictory. Five of the studies reviewed found differences in performance by education, two did not. Also, much of the research on education and performance was limited by inadequate research design and methodology, and the actual performance of nurses in delivering care to patients in the clinical setting was not measured.

STUDIES OF PERFORMANCE-RELATED VARIABLES

Several recent studies focused on the relationship of education to variables which are assumed to have an impact on performance. They are reviewed briefly because they assessed some aspects of care which have relevance to nurse staffing issues. All used instruments for which some, but not complete, evidence of reliability or validity was discussed.

Bullough and Sparks (1975) studied 393 graduating seniors from seven baccalaureate and associate degree programs to see if "care" and "cure" orientations could be distinguished in the two groups and linked to the type of educational program. This distinction was said to be related to the professional-technical dichotomy. On the basis of data obtained from a self-administered questionnaire, it was concluded that there were indeed significant differences in orientation between educational groups. Most baccalaureate students were care oriented; the associate degree students, although more divided in their tendencies, were cure oriented.

Richards (1972) conducted a study to determine if there were differences in performance-related variables, such as intelligence and professionalization, and personality characteristics such as leadership potential, responsibility, emotional stability, and sociability among baccalaureate, associate degree, and diploma nurses. A total of 361 graduating students from 13 schools of nursing were tested with four standardized instruments. Test results showed no statistically significant differences among groups in these characteristics, although baccalaureate graduates did have a more professional ideal of nursing. The investigator concluded that the results confirmed similar studies which have been unable to demonstrate differences among students from different types of educational programs.

Meleis and Farrell (1974) carried out a study relating the three levels of nursing education to performance-related variables such as intellectual characteristics, theoretical orientation, leadership qualities, research attitudes, and sociopsychological outlook and aspirations. Six standardized instruments were administered to a total of 188 senior students in six schools of nursing. No statistically significant differences were found among groups in intellectual characteristics or self-esteem. The study instruments contained three leadership measures. Similar levels of leadership qualities for the three educational groups were found by one measure. On a second leadership measure, associate degree students scored highest and diploma students scored lowest; a third leadership measure showed that baccalaureate and associate degree students felt that they had more autonomy than was perceived by diploma students. Differences were also found in research attitudes, with diploma students rated highest and baccalaureate students lowest. In general, however, students in the three types of programs were alike on many of the variables studied. The investigators concluded that there were more similarities among senior students in the three types of programs than many nursing educators had acknowledged.

Krueger (1971) compared the utilization of baccalaureate nurses, diploma nurses, licensed practical nurses, and aides in three hospitals and one health department. In this study, 128 nursing personnel responded to 88 questionnaire items concerning the frequency with which they performed various activities. As in the study by Welches, Dixon, and Stanford (1974), different categories of nurses (called O-types) were distinguished. Krueger differentiated between eleven of these, seven of which included only registered nurses. Five included both diploma and baccalaureate graduates, one included only licensed practical nurses, two included licensed practical nurses and aides, and three included licensed practical nurses and registered nurses. On the basis of this cluster analysis, Krueger concluded that the utilization of nurses in the study sample did not appear to be closely related to their educational preparation. (This study is also discussed in the next section of this chapter, Nurse Staffing Patterns.)

Thus, of studies using performance-related variables, one found differences between care or cure orientations by education, two found few, if any, differences by education in performance-related characteristics, and one found that utilization of nursing personnel was not closely related to educational preparation.

SUMMARY AND IMPLICATIONS: EDUCATIONAL PREPARATION OF NURSES

The descriptive literature on nurses' educational levels makes two major points: (1) new associate degree graduates have special problems when they begin employment, and (2) distinctions which exist among educational programs may not carry over to the practice setting, where all registered nurses are expected to perform the same activities at the same level of skill.

The perceptual surveys reviewed found that staff nurses and their supervisors and nursing directors perceived differences in performance levels according to educational preparation. As Hogstel (1977) pointed out, however, nurses from the three types of educational programs, in spite of acknowledged differences in their practice, may not be utilized differently on the patient care unit. An interesting finding by Reichow and Scott (1976) was that, over time, graduates of all three types of programs were considered by administrators to become equal in ability. This finding suggests that future studies should differentiate recent graduates from more experienced nurses.

A number of studies attempting to measure clinical performance of the different educational groups also found differences in performance levels by education. Highriter (1969) and Welches, Dixon, and Stanford (1974), however, found no relationship between educational level and performance while Frederickson and Mayer (1977) found differences in critical thinking, but not in problem solving ability, by education. In a somewhat different vein, Davis's (1972, 1974) studies of nursing performance found that, for all educational types, continuing education had a greater impact on quality and quantity of care than did experience. It must be pointed out that in all the studies of performance reviewed, performance was "measured" by paper and pencil tests and other proxy measures rather than by standardized instruments applied to nurses as they provided care in the clinical setting. Studies focusing on the relationship between education and other performance-related variables also yielded conflicting results. While Bullough and Sparks (1975) found differences between associate degree and baccalaureate degree graduates in "care" and "cure" orientations, Richards (1972) found no differences, and Meleis and Farrell (1974) found only a few differences in intelligence, leadership, and personality characteristics by education. Furthermore, in a study with a different focus, Krueger (1971) found no differences in personnel utilization by educational level when self-reported frequency of specific activities was assessed.

Review of the literature to date on nurses' educational preparation suggests a number of research questions which have apparently not been addressed, among them the effect on quality of care, amount of direct care provided, efficiency, and costs of employing nurses educated at different levels.

The relevance of educational preparation to organizational mode also was not addressed. It should be noted that most of the research on differences by educational levels has been within the context of team nursing. It is quite possible that the use of a variety of educational types on a nursing unit may be very applicable to team nursing, which allows for more flexibility in utilization of personnel. As the trend away from team nursing and toward the primary nursing mode continues, however, the effectiveness of such a variety of educational types must be questioned. As the increased accountability, authority, and decision making which are essential components of primary nursing become more widely accepted, the academic and clinical education of those in positions of accountability and authority will be scrutinized. The question then becomes which type of registered nurse can take on the primary nurse role, and what role other types of nurses can fulfill in primary nursing. Attention may have to be directed at modifying nursing education to respond to such changes in nursing practice. The trend toward primary nursing may represent a trend toward higher levels of educational preparation for nurses, but the nursing literature has not yet addressed this question.

In general, the literature on nurses' educational levels appears tangential to the area of nurse staffing, because none of the authors explicitly addressed the relevance of education to staffing, organizational mode, or other staffing issues. Nevertheless, the results of these surveys and studies indicate that the subject of educational levels does have important implications for nurse staffing. The distinction between technical and professional nurses, and the different capabilities of different educational groups, may warrant consideration whenever decisions about matching nursing resources to patient care needs are made.

NURSE STAFFING PATTERNS

A nurse staffing pattern is the specific combination of the types of nursing personnel employed in a hospital or nursing unit, i.e., of registered nurses; licensed practical nurses; and aides, orderlies, and attendants (Aydelotte 1978).

Historically, three distinct approaches to nurse staffing patterns can be identified. For a long time, fixed ratios of nurses to patients were used as a basis for staffing decisions. This approach was partly related to the concept of functional nursing and the later development of the team nursing mode. Subsequently, the management engineering approach with its focus on task allocation and efficiency was used; this approach coincided with the development of patient classification systems as well as the continuing development of the team nursing mode. Currently, the trend is toward having a staff comprised entirely of registered nurses. This trend is linked to the advancement of nursing as a profession and the development of primary nursing with its emphasis on patient care rather than on nursing tasks. In practice, staffing patterns have been influenced by the complex interaction of these historical approaches with variables such as staff availability, budget constraints, standards and philosophy of care, and institutional characteristics.

The reviews by Aydelotte (1973), Georgopoulos (1975), and Jelinek et al. (1976) included many articles and reports on staffing, but very few of these related specifically to nurse staffing patterns. Rather, the staffing literature discussed in their reviews centered on work sampling studies, patient classification, and management engineering approaches to efficiency in nursing care. Articles which dealt with staffing patterns focused on the traditional nurse staffing pattern consisting of a mix of registered nurses, licensed practical nurses, and nursing aides. Since the all-registered nurse pattern, an alternative to the mixed staff, is a relatively new concept, most of the literature dealing with it has been published since 1970 and thus was not included in the earlier staffing reviews. Even the recent nursing literature, however, contained few actual studies of this trend.

This section reviews first the literature published since 1970 on traditional mixed staffing patterns and then the literature on the all-registered nurse staff. The recent literature on both of these subjects is quite limited and consists primarily of descriptive and descriptive-evaluative articles, with only six research reports.

TRADITIONAL MIXED STAFFING

Descriptive Literature

Traditional mixed staffing can be defined as the employment of a combination of registered nurses, licensed practical nurses, and nursing aides and orderlies on a nursing unit. In a very general article on this concept, Mercadante (1970) discussed the increases in complexity, coordination, paperwork, and supervisory responsibility which have occurred in nursing practice in recent decades, resulting in different levels of nursing and different kinds of nurses with a range of skills and preparations. Mercadante claimed that recognition of these different levels is necessary for the effective utilization of hospital nursing personnel. Appropriate utilization of personnel can then be facilitated by determining the proper level of preparation and skill required to perform the various activities of patient care.

Descriptive-evaluative Literature

Two articles on task allocation among nursing personnel presented some evaluation results. Hallstrom (1971) discussed task delegation and utilization of personnel at the appropriate skill level in a comprehensive health care program. She presented a theoretical rationale for task delegation and described a study of task definition and personnel utilization in Children and Youth projects. Good agreement among categories of health team members concerning who did and should perform a number of tasks was found.

More relevant to the issues of hospital staffing, an article on task allocation and utilization of personnel by Francis (1977) described a survey at a large, urban medical center that was conducted to determine which tasks were being performed by each level of personnel. A questionnaire listing 138 tasks was developed and sent to 1306 nursing personnel providing direct care in either inpatient or outpatient areas of the medical center. The questionnaire was completed and returned by only 38 percent of the survey population. Techniques used to analyze the data were not specified.

The survey revealed that nurses' aides, as a group, were carrying out the largest number of tasks for which they were considered unprepared, especially in oncology and pediatrics, followed by low level practical nurses on intensive care and burn units. Although higher level practical nurses and registered nurses appeared to be performing substantially fewer tasks for which they were unprepared than were aides and lower level practical nurses, they too were providing many elements of patient care for which they were considered unqualified.

Francis concluded that a major difficulty in the proper utilization of personnel in this study setting was that the least educated personnel were functioning in some of the most technologically complex patient care areas. The central question suggested by these survey data was why personnel were doing tasks beyond their ability and training. Pointing out that further research was needed, Francis stated that a partial answer to this problem of misutilization might relate to the concepts of primary, secondary, and tertiary care. "Nursing seems to have agreed on the three levels or types of 'care' but who shall deliver that care at each level remains to be fully implemented" (p. 69).

Research Literature

Only four research reports related to the traditional mixed staffing pattern were found, and of these two are of limited relevance to the inpatient setting. The latter two articles are reviewed briefly.

In Yeomans' (1977) study, the majority of the subjects represented the outpatient setting, and the activities of different types of registered nurses, rather than those of different categories of nursing personnel, were compared. Yeomans focused on the functions of nurses in expanded and traditional roles in a large military medical center, and compared activity patterns of traditional role nurses in outpatient areas, traditional role nurses in inpatient areas, and expanded role nurses in outpatient areas. Activities were grouped under the headings of assessment, intervention, and instruction. The investigator found distinct differences among the activity patterns of the three personnel groups and attributed these in part to differences in work setting and role.

Smith (1974) studied how different types of nurses perceived their work and the work of others, rather than their actual activities. It should be noted that two of the four groups studied represented personnel not regularly assigned to the inpatient unit. A total of 30 head nurses, clinical specialists, nursing educators, and nursing office administrative and supervisory personnel answered a 124-item questionnaire about what they perceived to be their own work and the work of the other three groups of respondents. Eight activity groups were explored. Smith found little consensus within any group with regard to its own functions or the functions of the other groups. Some overlapping of performance of activities was suggested, although the investigator hypothesized that this may have reflected a lack of precision in describing the activities.

Cobb and Warner (1973) reported on a study in the area of personnel utilization and task allocation. Set in the 300-bed Annapolis Hospital, Wayne, Michigan, this study sought to determine how task substitution among different nursing skill levels could be measured. Since this was an exploratory study testing two ways of measuring task substitution, no independent or dependent variables were defined.

To ascertain the frequency and type of task substitution, a 105-item questionnaire drawn from the job classifications of all levels of nursing personnel was sent to the registered nurses, licensed practical nurses, aides, and orderlies on all medical-surgical units of the hospital. The subjects were asked to state how often they performed each task on a scale of 1 (never) to 6 (seven or more times a day). The reliability and validity of the instrument were not discussed, although the investigators acknowledged the limitations of self-reporting as compared to work sampling methods. Eighty-one usable questionnaires were returned (the response rate was not reported), and 65 of the questionnaire items were used in the calculation of substitution rates. To obtain a useful measure of how much substitution actually occurred, frequencies of performance were assigned to each response. The investigators acknowledged that these frequencies were assigned somewhat arbitrarily and that this restricted the precision of their findings. A second method used to establish substitution rates was based on actual lengths of time required to perform each task. This method was used for tasks for which specific times had been calculated by the Commission for Administrative Services for Hospitals (CASH) (1968).

Responses to the questionnaires revealed that registered nurses appeared to have a discrete set of tasks for which licensed practical nurses, aides, and orderlies did not as a rule substitute, although in fact substantial substitution did occur. When performance frequencies were assigned to responses, it was shown that licensed practical nurses substituted for registered nurse tasks at a rate of 19 percent, aides at a rate of 2 percent, and orderlies at a rate of 1 percent. In turn, registered nurses substituted for licensed practical nurse tasks at a rate of 20 percent, aides at a rate of 7 percent, and orderlies at a rate of 9 percent. For aide tasks, registered nurses substituted at a rate of 7 percent, licensed practical nurses at a rate of 10 percent, and orderlies at a rate of 18 percent. When CASH times were included in the calculation, different substitution rates were found. The investigators concluded from this discrepancy that the length of time required to perform a task was an important factor which should be included in calculating substitution rates. They also concluded that substitution rates did not represent equally all tasks within groups but only a small number of specific tasks for each personnel group.

DiMarco et al. (1976) conducted a utilization study of traditional staffing patterns on ten medical-surgical units at a 300-bed university affiliated hospital in the midwestern United States. The study examined the relationship between nursing resources and quality of care and used the following independent variables: number of full-time and part-time registered nurses; number of full-time and part-time licensed practical nurses; number of full-time and part-time aides; number of full-time and part-time students; number of nurses with a baccalaureate degree; patient census; and number of highly dependent patients.

Quality of care, the dependent variable, was assessed for 71 patients randomly selected over a one-year period. The assessment instrument, which apparently was devised by the investigator, was based on standards of nursing care developed by Carter et al. (1975). It extracted data from three sources, i.e., the care plan, the chart or nursing record, and an audit of the patient and his environment. Evidence of interrater reliability and of content and criterion-related validity was presented.

Analysis of the study data in terms of means and standard deviations for all variables, correlations between variables, and regression analysis, revealed that the quality of the nursing care plan was inversely related to the number of part-time student nurses, full-time aides, and part-time and full-time registered nurses. The quality of the nursing record was found to be inversely related to the number of full-time students and the number of patients on the ward. The negative correlations found between quality of documentation and the number of personnel of different types was considered a reflection of negative attitudes among the personnel toward the written nursing care plan. The investigators felt that even full-time registered nurses did not perceive the importance of the written plan, considering verbal communications at shift report an adequate substitute. Since a significant positive correlation was found between quality of the plan and quality of the care the patient actually received, the total quality of nursing care was found to be inversely related to the number of full-time students, part-time registered nurses, part-time students, full-time aides, and full-time registered nurses.

In terms of overall quality of patient care, the number of full-time students seemed to constitute the most negative resource value, followed by part-time registered nurses, part-time students, full-time aides, and full-time registered nurses, in that order.

The investigators stated that their findings had clear implications for the utilization of nursing personnel, in that nursing unit personnel are not interchangeable and must be carefully educated before they can assume specific patient care responsibilities. The investigators also concluded that the resource value of full-time and part-time student nurses, full-time aides and part-time registered nurses on the patient care unit was questionable.

A study discussed in the preceding review of literature on nurses' educational preparation was also found to be of some relevance to nurse staffing patterns. Conducted by Krueger (1971) in three hospitals and one health department in Colorado, this study examined the effect of educational levels --baccalaureate, diploma, licensed practical nurse, or aide -- on the utilization of 128 nursing staff members in the study setting. Based on these nursing staff members' responses to questionnaire items about their activity patterns, eleven different types of nurses (O-types) were distinguished. Analysis of these types led Krueger to conclude that the utilization of the personnel studied was not closely related to their education or rank within the nursing hierarchy.

In general, the research literature on traditional staffing patterns reported findings of both separate and overlapping activity patterns for different levels of personnel. One recent study also explored the relationship between staff composition and quality of care and suggested the optimum mix for achieving high quality.

ALL-REGISTERED NURSE STAFFING

The exclusive use of registered nurses as providers of nursing care on a hospital unit is generally referred to as all-registered nurse staffing, all-RN, or all-professional staffing. This staffing pattern is a recent departure from the traditional pattern using a mixture of registered nurses, licensed practical nurses, nursing aides, and orderlies to provide nursing care. In all-RN staffing a small number of less skilled nursing personnel may function on the unit as assistants to the registered nurses, but they give no actual nursing care to patients.

Discussions of this concept usually made no distinctions among the three educational levels of registered nurses -- baccalaureate, associate degree, and diploma. As the review of the literature on the education of nursing personnel revealed (see preceding section), distinctions between nurses in the educational setting are not generally carried over to the practice setting, where registered nurses are usually given the same tasks and responsibilities regardless of their education.

Descriptive Literature

A number of descriptive articles discussing the all-RN staff have been written by staff members at the Loeb Center for Nursing and Rehabilitation. In an early article, Hall (1963) explained that the Center's philosophy is that the public deserves and can benefit from professional nursing care. Consequently, at Loeb the registered nurse is the chief therapeutic agent and the sole provider of nursing care. In later articles, Hall (1969), Alfano (1969), Anderson (1971), Englert (1971), and Bowar-Ferres (1975) expanded on the philosophy and the role of the professional nurse at Loeb.

Martin et al. (1973), Jefferson (1978), and Allen (1979) made mention of an all-RN staff but as the chief subject of their articles was primary nursing, they contained little specific information on the advantages or disadvantages of this staffing pattern. Also within the context of primary nursing, Osinski and Morrison (1978) described the simultaneous implementation of primary nursing and all-RN staffing at the Mainland Division of the Atlantic City, New Jersey, Medical Center. In this hospital, the nursing department's conviction that nurses should nurse the patient and not the desk, and recognition that the cost of training nursing assistants who could assume only limited responsibility was very high, led to the adoption of all-RN staffing. Christman, contributing to an article on cost effectiveness by Cicatiello et al. (1978), strongly advocated the implementation of all-RN staffing as a way to control costs, promote quality, and, by eliminating nurses' aides, reduce staff conflicts.

Thus, while the descriptive literature on the Loeb Center and other settings with an all-RN staff favored this innovative staffing pattern, no evaluation of the effects of all-RN staffing was reported to support conclusions on resulting cost savings and improved quality of care.

Descriptive-evaluative Literature

Several articles describing all-RN staffs (Eagen 1970; Marram 1973; Dahlen 1978) presented favorable results of experiments with primary nursing and all-RN staffing, but it was not possible to distinguish outcomes of the change in organizational mode from outcomes of the change in staffing patterns.

Ellis (1978) reported on a conference on the all-RN nursing staff held in Chicago in July 1978 and observed that the trend in hospitals practicing primary nursing has been to move in the direction of an all-RN staff. She considered this type of staffing to be the complement of primary nursing. Potential advantages of all-RN staffing discussed at the conference included cost savings due to reduction in numbers of personnel, increased flexibility of nursing staff, less need for middle management and less fragmentation of care, increased ability of the nurse to respond to patient needs, and enhanced patient and job satisfaction. In the same article, Ellis reported briefly on evaluation findings suggesting that all-RN staffing can reduce staffing costs and improve quality of care. Details of the evaluation methods used were not provided.

Osinski and Powals (1978) reported on an informal follow-up three years after implementation of all-RN staffing at the Mainland Division of the Atlantic City, New Jersey, Medical Center. As part of the evaluation effort, questionnaires were given to patients, nursing staff, and physicians to elicit their reactions to the nursing care provided, and very favorable responses were obtained. Nursing care hours spent per patient, staffing costs, nurse turnover, overtime, and absenteeism were also monitored. For all these measures, primary nursing with an all-RN staff was reported to be successful. Here, too, it was not possible to separate the outcomes of all-RN staffing from those of primary nursing, which was implemented at the same time.

Several reports described all-RN staffing within the context of organizational modes other than primary nursing. Forster (1978) described a five-year plan to implement the all-professional staffing pattern at the Community Hospital of Ottawa, a 154-bed facility in Illinois. When the change to all-RN staffing began in 1975, functional nursing was the organizational mode and the hospital had serious staffing problems. Over the years, the hospital moved through team nursing and total patient care systems and finally implemented primary nursing. During this time, improvements in nursing time spent with patients and in staffing costs were realized. On one 55-bed pilot unit, for example, registered nurse hours per patient day, viewed as a measure of quality, increased by 79 percent between 1974-5 and 1978-9, and a savings of $83,000 in salary costs for the unit was realized. For the hospital as a whole, dramatic increases in registered nurse hours per patient day, with decreases in overall staff hours per patient day and in staffing costs, also occurred. Forster concluded that by implementing changes which transposed the ratio of registered nurse to nonregistered personnel, the hospital brought about a positive change in patient care philosophy and quality.

Beath (1971) described all-RN staffing within a team nursing structure. She reported that the introduction of both all-RN nursing and decentralized supply and equipment facilities on a model team unit enhanced the provision of "clinically oriented care" and fostered patient and nurse satisfaction.

Harris (1974) reported on a experiment at Baptist Medical Center, Little Rock, Arkansas, where baccalaureate nurses only staffed a unit which had decentralized its supply and equipment facilities and which was organized under a team nursing structure. According to Harris, patient and nurse satisfaction increased as a result of these changes.

In summary, the descriptive-evaluative articles on all-RN staffing are very positive about its effects, attributing to it cost savings, increased quality, and improved patient and nurse satisfaction. The evaluation efforts by which these findings were obtained, however, appeared to be entirely subjective and informal.

Research Literature

Only one study on the all-RN staff was found in the literature. Harman (1974, 1975, 1977), at Misericordia Hospital, Edmonton, Alberta, sought to determine whether there was a difference between the quality of care provided by all-RN units and that provided by mixed staff units (registered nurses and certified nursing assistants). An additional objective was to develop an information system which would assist the nursing department in the management of day-to-day operations.

To meet these objectives, six study units were arbitrarily selected on the basis of factors such as other research projects under way, types of patients on the units, attitudes of unit supervisors, and comparability of pairs of units. The three units to be converted to all-RN staffing were then randomly selected. Each unit had the same number of nursing personnel. Five of the study units practiced team nursing, while one practiced total patient care, a mode in which each nurse was responsible for provision of all nursing care to a small group of patients and the immediate level of supervision represented by team leaders was eliminated.

A detailed audit including assessment of both the chart and of the patient by means of an interview was developed to measure quality on the study units. The audit was administered three times per week on each unit during two eight-week study periods, providing a total of 288 audits for the study. Neither instrument reliability and validity nor interrater reliability were reported. Other study variables on which data were collected included patient category, census, workload index, staff members' years of experience at the hospital, organizational mode of the unit, and numbers of full-time and part-time staff. Opinions of supervisors about the information system and of all-RN unit staff members about the new staffing pattern were elicited by means of self-administered questionnaires. Data analysis was based on calculation of percentage scores on the audits and used regression analysis to determine the relationship between chart audit and bedside audit scores.

The investigator found only a marginal difference in audit scores between the two staffing patterns. The average bedside audit scores showed no appreciable difference between the all-RN units as a group and the mixed units as a group. The average chart audit scores showed a small, statistically significant difference between the two groups of units, with the all-RN group obtaining the higher score. When the six individual units were compared, however, differences appeared which did not seem related entirely to staffing pattern. For example, the two highest chart audit scores were obtained for one all-RN unit and one mixed unit.

Harman also found a significant relationship between chart audit and bedside audit scores; no relationship existed between chart audit scores and workload index. Workload was found to vary widely among the units. Implementation of the information system, one of the goals of the project, occurred as planned, and nursing supervisors reported favorable reactions. Staff nurses on the all-RN units were divided in their opinions about whether quality was higher and whether they preferred to work on an all-RN unit. Many nurses from all-RN staffs said that they had to spend too much time on extraneous tasks. Finally, Harman reported that, on the all-RN units, quality of care was higher under the total patient care concept, in which each nurse was assigned to a group of patients for their entire stay on the unit, than under the team nursing concept.

On the basis of these findings, Harman concluded that the quality of patient care provided by a nursing unit, at least in the study hospital, was not influenced by providing an all-RN staff. He further concluded that quality of care was not affected by an increase or decrease in workload. Although it was acknowledged that quality differed among the units, Harman could only speculate on the reasons for the differences observed. He suggested that the motivation, attitudes, leadership, and organizational abilities of the nurse in charge may be more important determinants of quality patient care than the staffing complement, and that simply modifying the staffing pattern without making subsequent changes in methods of patient assignment and role classification may not automatically make for better patient care.

One other study related to this area is briefly mentioned. Harrington and Theis (1968) and Theis and Harrington (1968) compared nurses at the Loeb Center with those at two conventional hospitals in terms of their perceptions of organizational climate and its effect on the professional practice of nursing. Although the Loeb Center is a prime example of all-RN staffing, this facet was not explicitly addressed by Harrington and Theis, whose study focused on organizational modes of nursing (see Chapter 7).

SUMMARY AND IMPLICATIONS: NURSE STAFFING PATTERNS

Although there was a great deal of literature on general issues of nurse staffing, specific discussions of the traditional mixed staffing pattern were limited. In the purely descriptive literature, Mercadante (1970) emphasized the need to distinguish between different educational and skill levels of personnel in order best to meet patients' care needs. Hallstrom's (1971) descriptive-evaluative article, based on experience in a comprehensive health care program, offered a theoretical framework for task delegation but presented only incomplete findings about how tasks were in fact allocated. A descriptive-evaluative article by Francis (1977) was more relevant to issues of inpatient staffing and found that all levels of personnel, but especially those at the lowest level of preparation, were performing tasks for which they were not prepared.

The research literature concerning the traditional mixed staffing pattern is limited to two relevant studies, as the Yeomans (1977) and Smith (1974) studies, although interesting in themselves, dealt with study settings or populations not related to inpatient staffing. Cobb and Warner (1973) presented approximate substitution rates for four categories of nursing personnel, based on personnel self-reports, and found that although registered nurses had their own set of tasks, there was still a significant amount of task substitution in the study hospital. In the same vein, Krueger (1971) found little effect of level of nursing preparation on utilization. DiMarco et al. (1976) performed the only recent study on the traditional staffing mix which defined independent and dependent variables and addressed issues of reliability and validity. Their findings on the effect of different mixes of staff on quality of care are clearly of importance to questions of inpatient staffing.

The literature on the all-RN staff is closely linked to that on primary nursing and it is difficult to separate observations of this nursing mode from those of all-RN staffing. The descriptive literature merely presents the philosophy behind the all-professional staffing pattern at the Loeb Center and other instititutions. This literature, as well as the literature containing some evaluation results, is quite positive about this staffing concept. Specifically, decreases in staffing costs, turnover, absenteeism, and fragmentation of care, and concomitant increases in quality of care, continuity, communication, nursing hours per patient, nurse satisfaction, and patient satisfaction were reported, but these findings were based on informally conducted evaluations. On the other hand, the only thorough comparative study of all-RN staffing by Harman (1974, 1975, 1977), found that quality of care was not influenced by the introduction of an all-professional staff.

None of the literature discussed potential problems which may be encountered in all-RN staffing, nor was the question addressed as to what kind of registered nurse -- baccalaureate, associate degree, or diploma graduate -- is needed in different all-RN settings. The possible difficulties in obtaining the large numbers of registered nurses required to implement this staffing pattern were likewise not considered, and the question of increased salary costs due to the upgrading of the nursing staff and the expansion of the professional component of the staff was ignored. A movement to all-RN staffing may require that activities formerly performed by nursing staff be reallocated to other departments of the hospital organization. For example, certain housekeeping, dietary, escorting, and supply activities previously performed by lower level personnel on a mixed nursing staff may be inappropriate activities for registered nurses on an all-RN unit. Such a reallocation of tasks would also have to be considered in estimating the cost of the all-RN staffing pattern. Finally, Harman's suggestion that quality of care on a nursing unit may be determined more by the attitudes and leadership abilities of the head nurse than by specific staffing patterns deserves serious attention in any examination of nurse staffing issues.

THE USE OF PART-TIME AND AGENCY PERSONNEL

The shortage of nurses in the United States has been the subject of debate for many years and was recently confirmed in interviews with nursing leaders across the country (Cunningham 1979). According to Levine (1978), one of the indicators of a shortage of registered nurses has been the large number of nurses who are employed part-time. This number has grown from approximately 5 percent in 1950 to about 30 percent in 1977. Employers are not able to replace these part-time personnel with full-time staff because sufficient numbers of nurses willing to work full time are not available. Some authors have stated that there is more of a problem of maldistribution than of an actual shortage of nursing personnel. Others have said that while adequate numbers of nurses have graduated from nursing programs, not enough continue to work in nursing to meet the demand.

Whatever the reason, it is apparent from reviewing the literature that hospitals are having difficulty in adequately staffing their institutions with full-time personnel (Van 1980). This has led to increased reliance on part-time nurses and nurses provided by temporary employment agencies. For this review, therefore, the three major employment patterns are defined as:

> Full-time - A nurse employed by a hospital to work a full schedule.
>
> Part-time - A nurse employed by a hospital to work less than full-time on a schedule of a set number of hours per week or as needed.
>
> Agency nurse - A nurse employed by an employment agency and assigned by and paid by that agency to work on a temporary basis in hospitals contracting with the agency. The nurse may work a part-time or full-time schedule, depending on her wishes and the needs of the hospital.

Agencies providing temporary nursing personnel to health facilities have proliferated in the last few years. The rise of these agencies appears chiefly to be a response to three factors. First, as mentioned earlier, health care institutions have experienced a shortage or lack of availability of nursing personnel. Second, cost considerations have forced many hospital nursing departments to reduce their nursing staffs and to eliminate internal float and part-time pools. Hospitals have found it less difficult and less costly to turn over the complex management problem of staffing for fluctuating workloads to outside agencies which can provide extra staff needed at peak workload periods. By using these agencies, hospitals avoid having extra staff on their payrolls when workload is low. Third, the proliferation of agencies has been influenced by increases in hospital nursing workloads and concomitant increases in the need for personnel, caused in large part by reduced patient length of stay and increased complexity of care.

In the recent literature, "agency nurses" are frequently referred to also as "temporaries" or "supplemental nurses." Since these agencies have become widespread only in the past few years, no previous literature reviews on supplemental nurses were found, nor do there appear to be previous reviews of the literature on the use of part-time nursing personnel. Also, no research reports were found on either type of personnel.

DESCRIPTIVE LITERATURE

Part-time Personnel

Only three articles in the recent nursing literature dealt with the use of part-time hospital nurses. Werther (1975) and Katz (1978) reported that the use of part-time personnel can greatly ease scheduling problems experienced by nursing departments or hospitals. Labor costs may be lower, as these personnel receive fewer fringe benefits; they also have lower turnover and absenteeism. Disadvantages of employing part-time nurses or other personnel include the increased need for supervision and recordkeeping and the increased cost of training.

Johnson and Marcella (1977), two coordinators of part-time nursing care, also discussed the advantages and disadvantages of part-time employment for both the part-time nurse and the institution. They pointed out that part-time employees can provide needed staff and may work more than their share of undesirable hours, with less absenteeism and turnover. Drawbacks to part-time employment include cost to the institution of in-service training, psychological conflicts with full-time employees, disruption in continuity of patient contact, and added expense and insecurity for the nurse. Johnson and Marcella felt strongly that part-time nurses should have the same rights as full-time nurses.

Agency Nurses

The descriptive literature on agency nurses reflects some controversy over their use. Two early articles were entirely positive. Luneski (1973) interviewed some agency nurses and found that they liked the variety in their work and the opportunity to have flexible schedules, to work part-time, and to refuse assignments. Another article, "For Nursing Directors--Can the Temporaries Help You Solve Staffing Problems?" (n.a. 1973) reported on interviews with nursing directors who had used agency nurses. Most found the agencies cooperative and the agency nurses competent. Some directors said that occasionally an agency nurse was not up to date or did not do her share of the work.

Wiley (1976) stated that the temporary employment agencies are the only option for new graduates in an area where jobs are limited or hospitals demand experience; for career nurses who have passed the mandatory retirement age; and for nurses with young families who can only work a couple of days a week. He explained that the agencies assume responsibility for Social Security deductions, workmen's compensation, unemployment insurance, and professional liability insurance. He also described what an agency nurse should look for and expect from the temporary agency employing her.

One temporary service agency, the Western Temporary Services, Inc., was described by Stover (1975), its president, with regard to the development of its first office offering temporary nursing personnel in Rochester, New York. Stover emphasized the ability of the agency to match the needs of nursing employers with the availability of inactive nurses. Jett (1977) described the expansion of this agency across the country.

Turkoski (1977), on the other hand, in a letter to the editors, objected to the practice of the Journal of Nursing Administration in accepting advertising from temporary agencies. The editors of the journal requested a reply from representatives of Staff Builders Medical Services and Homemakers Home and Health Care Services, Inc., and five contributing editors to the journal. The general consensus of the responses was that these agencies had developed to meet an existing need, that they had not caused the lack of available nurses, and that they provided a service to health facilities. Some of the writers expressed the opinion that if hospitals had good personnel practices allowing part-time employment, temporary agencies might not be needed.

Amenta (1977) reported on a conference on the issues involved in using agency nurses. The participants believed that criteria should be developed for their use and responsible surveillance should be imposed. They also recommended that a limit be placed on the percentage of agency nurses used on any unit. The participants considered cost savings to the hospital as the chief advantage to the use of agency nurses. Failure of agencies to check credentials, inadequate orientation of agency nurses, resentment on the part of regular staff, and potentially negative effects on continuity and quality of care were mentioned as disadvantages to the use of agency personnel.

The American Journal of Nursing (1977) related that some hospitals in Minnesota had been using agency nurses extensively. Nurses employed by hospitals in Minneapolis and St. Paul were concerned that the widespread use of agency personnel would adversely affect quality of care and the ability of new nursing graduates to find jobs. A new labor agreement called on hospitals to use agency nurses only when they could not cover needs with their own staff, and required that hospitals provide the Minnesota Nurses' Association with a bimonthly report of how and where agency nurses were used.

Donovan (1978a), in an article on agency nurses, stated that as long as continuity of care and primary nursing were emphasized, the permanent full-time nurse would remain the backbone of the nursing service. Both Donovan and Traska (1978a) questioned whether state laws were needed to monitor temporary agencies, while Traska, (1978a), Ress (1979), and Van (1980) discussed the rapid growth of temporary employment agencies providing agency nurses to hospitals. Traska suggested that one problem with the use of agency personnel is that they get their choice of shifts, often leaving permanent staff with the more undesirable schedules and heavier workloads. Marriner (1979), in an article on the many factors affecting staffing, included a brief discussion on the use of part-time and agency nurses to meet the fluctuating needs for hospital nursing services.

Although the agency nurses' lack of orientation to specific hospitals and their resulting unfamiliarity with routines was frequently mentioned in the articles discussed above, only one article was found that dealt exclusively with this issue. Leffler (1979), the Director of Nursing Staff Development at Riverside Methodist Hospital, Columbus, Ohio, described a one-day orientation program she had developed for registered nurses and licensed practical nurses from temporary agencies who worked at that institution. The agencies were notified that regardless of nurse qualifications, only those personnel who had attended the program would be permitted to practice nursing in the hospital. The agencies, program participants, and personnel at other hospitals in the area reacted favorably to this approach.

One alternative to the use of commercial agencies was presented by Wollard (1976), who described the development of a program conducted by the Midtown Hospital Association in Denver, Colorado. The program provided nursing personnel on an as-needed basis to its seven member hospitals. The nursing personnel hired by Midtown were given orientation on each hospital for which they decided to work. The use of personnel from Midtown was approximately 12 percent less expensive than hiring personnel through commercial agencies. This program showed that a shared nursing pool can be used by hospitals to enable them to staff effectively during months of high use while avoiding overstaffing during low use periods. The program had also attracted qualified nursing personnel back into the field on a part-time basis.

In general, the authors quoted agreed that the use of part-time and agency nurses can ease staffing problems in hospitals, but recommended that criteria be developed for the use of agency nurses, that responsible surveillance be instituted, and that orientation programs be made available to this type of personnel. They acknowledged the rapid growth in the use of agency personnel, questioned whether state laws were needed to regulate the agencies, and advised that a limit be set on the percentage of agency nurses used on any one hospital nursing unit. One alternative proposed to the use of high-cost commercial agency nurses was that a local hospital association provide similar services at a lower cost.

DESCRIPTIVE-EVALUATIVE LITERATURE

No descriptive-evaluative literature was found on the utilization of part-time nursing personnel. While a series of articles contained some findings relevant to the use of agency nurses, the evaluation methods were not described in sufficient detail in any of these articles to assess the significance of the findings.

Duffus and Smith (1976), assistant director of nursing and employment manager at Western Pennsylvania Hospital, a 610-bed hospital in Pittsburgh, described how agency nurses from Homemakers Upjohn were used to meet unexpected highs in census and increases in workload. The agency nurses were well received by physicians, nurses, and administrators, although physicians excluded them from critical care areas. The hospital realized an appreciable annual savings. A survey of all nursing staff at the hospital revealed positive attitudes toward the program one year after its inception. The hospital personnel felt that Homemakers Upjohn's standards were as high as their own and provided qualified nursing personnel, which contributed greatly to the success of the program.

Boyer (1979) reported on a survey of nursing administrators about the use of temporary nurses from outside agencies. The survey was conducted by the Commission on Nursing Practice of the Pennsylvania Nurses' Association. A questionnaire was developed and sent to all directors of nursing in acute care, extended care, and public or home health facilities in the state. Fifty-five percent responded and 19 percent of respondents indicated that they used nurses from outside staffing agencies. Most directors in acute care and extended care facilities said that they used supplemental staff because of shortages of nurses in their geographic area, while directors in public or home health agencies used them because they were more flexible.

The survey also revealed that the orientation given to agency nurses varied greatly among these facilities, and that the weaknesses of using supplemental staff far outweighed its advantages. Boyer recommended that directors of nursing who employ nurses from supplemental staffing agencies should become discriminating consumers, and that details of the agencies' screening procedures, financial arrangements, supplying procedures, and performance evaluation should be agreed upon by agency and institution. Orientation programs should be planned and nurses should be reassigned to the same health care facility and same unit as often as possible. Supplemental staff should also be encouraged to attend continuing education programs.

The Chicago Hospital Council (1978), in conjunction with a task force of Chicago area nursing administrators, conducted a survey on the utilization of nurse registries by member hospitals and an evaluation of the services provided by these registries. Eighty-six percent of the Council membership participated in the survey.

Major findings were that in the majority of cases, registry services were not used for temporary situations but for filling full-time personnel shortages. The data indicated that the 24 nurse registry services serving the Chicago area hospitals were not able to meet all the needs of the hospitals in terms of quantity and quality of services. The survey also indicated that hospitals were losing more employees to nurse registry services than they were hiring from them. The survey information, which included detailed comments by the administrative personnel of the hospitals on the advantages and disadvantages of using employees of nurse registry services, was to be used in negotiating with nurse registries to improve the standards of service to hospitals and to collaborate in tackling the major problem, i.e., the registered nurse shortage in the Chicago metropolitan area.

Mahan and White (1978) reported on a comprehensive survey of the recruitment of registered nurses by California hospitals, nursing homes, and other health facilities. Questionnaires were developed to elicit information on numbers of employees, numbers of vacancies, recruiting procedures, salaries, reasons why personnel resign, and the use of supplemental nursing agencies. Results indicated that 14 percent of the full-time nursing positions in hospitals were vacant and that the use of agency personnel was widespread; i.e., 60 percent of the hospitals, 58 percent of the nursing homes, and 51 percent of other health facilities used agency nurses. All institutions favored permanent employees over the use of supplemental personnel, and 47 percent of the hospitals and 48 percent of the nursing homes reported that they had lost at least one registered nurse to a supplemental agency. The daily cost of using agency staff was also found to be high. The average fee per full-time registered nurse per shift employed by hospitals was $56.18 plus $15.55 in benefits, while the average fee per supplemental agency nurse per shift was $90.89, or a difference of 27 percent.

Cooke (1979), from the Office of Health Planning, Ohio Department of Health, reported on a preliminary investigation into the use of agency nurses and their effect on the nurse labor market. She found that hospitals and nursing homes throughout Ohio, particularly in large urban centers, were experiencing a shortage of nurses. Many had been forced to rely on supplemental staffing agencies and the use of these agency nurses had raised serious concern among nursing administrators over the cost, quality, and continuity of patient care. Cooke found that nurses working for supplemental agencies considered the opportunity to keep in touch with the profession and to earn slightly higher salaries than permanent employees to be advantages of their work. These nurses considered the following to be disadvantages of working through supplemental agencies: lack of stability, unpredictability of location of work, unfamiliarity with policies and procedures, lack of peer group support, difficulty in providing continuity of care, lack of accumulated status and promotion, and sacrifice of professional power.

The author felt that other methods for lessening the adverse effects of supplemental staffing were needed in addition to the present strategy of the Ohio Nurses' Association, which consisted of providing health care facilities and supplemental agencies with guidelines for employing temporary nurses. These alternatives included a screening process to be used by the supplemental agencies and guidelines for the health care facility regarding orientation and supervision. Cooke acknowledged that guidelines offered valuable suggestions, but felt that their ability to effect change was limited. She stated that the regulation of commercial staff pools was difficult because they were private enterprises and not subject to licensing or other certification. Specific alternatives proposed included the following: limiting the proportion of staff which a hospital or nursing home may employ from a supplemental agency; bringing the commercial staff pools under licensing laws; creating laws requiring competency tests for relicensure which would restrict licenses to persons with certain technical skills, thereby increasing the quality of care; and having local hospital associations organize their own part-time nursing pools. Cooke also stated that hospitals should institute policies to increase the responsiveness of the nurse supply to current demand, such as flexible hours, more part-time positions, hospital sponsored day care centers, more refresher courses, and other factors associated with increased job satisfaction. She concluded that the use of agency nurses had the potential for being a cost-effective measure for hospitals experiencing staff shortages.

Langford and Prescott (1979), both nursing educators, reported on a pilot study to identify issues and concerns relating to the use of supplemental nursing agency personnel. Interviews and surveys of nurses in both hospitals and supplemental agencies showed that there was an uneasy relationship between hospitals and temporary nursing personnel services. Major concerns were quality and continuity of care; the values of temporary nurses that may affect the care they give; and the morale among hospital-employed nurses.

A more general concern voiced by nurses in administrative positions was to the effect that if supplemental agency services were the only real alternative to shortages, and if these services were attractive, nurses would begin to work for the supplemental agencies rather than for hospitals. This could lead to an increase in vacant hospital positions, which in turn would increase reliance on supplemental agencies. Such a shift away from hospitals as the major employers of nurses raised concern regarding the loss of organizational control over performance and the drastic increases in costs as a result of creating a "seller's market." If costs were to rise substantially, the only possible response under constraints of cost containment would be to alter staffing either by decreasing the absolute numbers of nurses or by decreasing standards with regard to the level of preparation of nurses employed.

In an effort to analyze the future of this relationship, Langford and Prescott presented three possible trends in the current situation: hospital control, agency control, and cooperative action, arguing that simply allowing the situation to evolve according to natural tendencies could produce results that would not be entirely desirable either for the hospital or the temporary services. The authors recommended that research be undertaken to describe the phenomenon more fully, and that nurse administrators in both hospitals and supplemental agencies assume responsibility for decisions affecting the eventual outcome of their relationship.

In a subsequent article Prescott and Langford (1979) again reviewed the characteristics, advantages, and disadvantages of supplemental nursing agencies. They said hospital-employed nurses whom they interviewed, regardless of their level, believed agency nurses delivered a lower quality of care than hospital staff. Prescott and Langford stressed the need for the systematic exploration of these services, so that facts instead of emotions could provide a sound basis for determining policy and practice in regard to their use. In addition to the potential problems with agency nurses cited in their other article, they mentioned the possible negative effect of the use of agency nurses on a hospital's ability to recruit and retain regular staff. Specific issues to be investigated included working conditions; the relationship of agency nurses to hospital employees; the impact of agency nurses on the quality of care; and the communication between nursing agencies and hospitals.

In summary, most of the descriptive-evaluative literature on the use of agency nurses was based on survey results. One survey of hospital nursing staff who had worked with agency nurses from a specific agency revealed positive staff attitudes toward these agency nurses. Four surveys of nurse or hospital administrators found widespread use of agency nurses not only to respond to periods of increased census, but to compensate for full-time staff shortages. Major concerns associated with the use of agency nurses were quality of care, continuity of care, and costs, although no definitive data were presented to support these conclusions.

No research literature was found on the use of either part-time or agency personnel.

SUMMARY AND IMPLICATIONS: THE USE OF PART-TIME AND AGENCY PERSONNEL

The literature indicated that the nurses employed by agencies considered the following as advantages over hospital employment: flexibility of hours to accommodate their personal schedules; possibility to keep in touch with the profession despite part-time work; on occasion, higher salaries than those paid by hospitals; ability to refuse assignments without penalty; and assumption by the agencies of responsibilities concerning withholding taxes, bonding, malpractice insurance, and Social Security.

On the other hand, these nurses believed that there was some disadvantage to employment by staffing agencies, among them the lack of stability of regular employment; unpredictability of location of employment; unfamiliarity with policies and procedures; lack of peer group support; difficulty in providing continuity of care; lack of accumulated status or promotion; and the sacrifice of much professional power and of the ability to implement change in the work setting.

The main advantage to hospitals in employing agency nurses was the ability to maintain adequate staffing levels. The question of whether costs for these services were lower or higher was not answered definitively in the literature. One hospital survey showed that the current costs for agency nurses were approximately 30 percent higher than the total cost (wage and benefits) of an equivalent staff nurse (Mahan and White 1978). Other institutions believed that the use of agency nurses was cost effective, and that, when an immediate need for additional nursing staff arose, a nurse from a temporary agency would probably be less costly than overtime paid to a regular employee (Cooke 1979). Furthermore, hospitals were relieved of paying for Social Security, unemployment insurance, and workmen's compensation; of providing paid holidays, sick leave, vacations, bonuses, health plans, and in-service training; and of associated record keeping. If hospitals decide to manage with a minimal full-time staff and use more agency nurses, they can cut down on absenteeism and turnover costs.

On the other hand, the concerns expressed by hospital and nursing home administrators with regard to using agency nurses were numerous. Three major concerns were cost, quality of care, and continuity of care. Patient care can be adversely affected as agency nurses are familiar neither with the patients and their individual needs nor with the institutional routines, policies, and procedures. More seriously, some agencies employed nurses without checking their credentials, licensure, or references.

Other complaints and concerns of hospital administrators about agency nurses included their lower productivity compared to the regular staff because of their unfamiliarity with the hospital; the time it took the regular staff to orient them; the lack of skill and knowledge of some of the nurses; and the possibly adverse effect on the morale of the regular staff, as the agency nurses work the days and hours they wish and the regular staff fills in. Also, the regular nurses generally carry the heaviest load and the sickest patients. In short, many concerns were voiced regarding the use of agency personnel, but there is no evidence or data to support these statements. Questions as to what effect agency personnel have on the quality of patient care, error frequency, continuity of care, nursing morale, productivity, and hospital costs remain to be studied in detail. In addition, the effect of increasing numbers of agency nurses on issues of nurse staffing in hospitals requires further study.

Of interest for this literature review is the question of how part-time and agency personnel may affect team and primary nursing practice. Although this question has not been studied in detail either, some general observations can be made. Team nursing allows for flexibility in assignments and it seems possible that part-time and agency personnel could fit into this organizational mode of nursing practice. On the other hand, the basic philosophy of primary nursing is continuity of care, with one nurse directing all of a patient's care and accepting 24-hour responsibility and accountability. It seems unlikely that part-time nurses or agency personnel could fulfill the role of a primary nurse, unless they are assigned full time to a specific hospital nursing unit. Also, primary nursing in some hospitals may require special educational and clinical preparation. None of the literature reviewed discussed different uses of or assignments for the baccalaureate, diploma, or associate degree nurses assigned by agencies to hospitals.

Other issues which have not been addressed fully in the literature and require further study concern the agencies' policies regarding licensure and credential checks, orientation, supervision, continuing education, and performance evaluation. Characteristics of nurses who choose to work for outside agencies should be studied and compared with those of nurses employed by hospitals. Hospitals which rely heavily on agencies should be compared with those which do not. Whether hospitals with more liberal employment policies have less need for agency nurses is an additional question which the literature must yet address.

Chapter 5

INPUT FACTORS: PATIENT CARE REQUIREMENTS

The factors presented in the conceptual framework (see Figure 2) vary considerably in their effects on nurse staffing. It can be argued that the most obvious and indeed greatest effect stems from the requirements of the patient population for nursing care. Traditionally, the approach used to translate patient care requirements into nurse staffing requirements was based on a simple count of the total number of patients to be cared for and a predetermined estimate of the number of nursing hours needed per patient. Bed utilization data were often used to provide averages, and these averages provided a means for specifying nurse staffing primarily in regard to long term planning for the required budget positions. On a day-to-day basis, these estimates proved to be less than effective; there were frequent periods of either overestimation or underestimation of patient needs and required staff. While such procedures obviously contributed to operational inefficiencies, they were necessitated by the difficulties of anticipating and quantifying highly variable day-to-day patient care demands.

During the 1960s, research at The Johns Hopkins Hospital by Connor (1960), Flagle (1960) and Young (1962) resulted in the development of a patient classification scheme that identified patient requirements for nursing care in quantitative terms. The recognition that patient needs, although variable, could indeed be quantified and predicted led to improved procedures for the determination and allocation of nursing resources. The concept of patient classification entails a categorization or grouping of patients according to some assessment of their nursing care needs over a specified period of time (Giovannetti 1978). While not the only means for determining patient care demands, patient classification procedures are widely used as proxy measures of the need for care. For this reason, this section will be devoted primarily to the literature on patient classification.

The term, patient classification, refers to the procedures or instruments used to categorize patients; patient classification system is the term generally applied to the categorization instrument, the accompanying quantification or measurement of the nursing care required, and the methods of application. Current use of these terms, patient classification and patient classification system, arose following the work of Connor (1960). The concept, however, appears to have been first employed by Florence Nightingale when an informal system of patient classification reflecting the magnitude of the nursing workload was used for the placement of patients within the large open Nightingale wards.

Present patient classification systems grew out of early staffing research in the 1930s, nursing education research in the 1940s, and the application of industrial engineering techniques to hospitals in the 1950s. This was followed by a period of intensive research and development between 1955 and 1965, during which Connor (1960, 1961) proposed the fundamental concepts that came to form the basis of most current patient classification systems. Over the past decade, patient assessment and classification as a means for specifying nurse staffing requirements have been adapted, modified, and extended by many other researchers.

PREVIOUS LITERATURE REVIEWS

Several overviews of patient classification systems are in the literature. A review of the early methodological studies in patient classification was made by Abdellah and Levine (1965) in the first edition of their book on nursing research; a revised edition contains references to more recent work (Abdellah and Levine 1979). Aydelotte (1973) included in her review and critique of the literature on nurse staffing methodologies a comprehensive discussion of over 40 items in the literature referring to patient classification systems. She questioned the validity of the assumption which is the basis for the quantification of most patient classification systems, i.e., that care received is equal to care required. Moreover, Aydelotte pointed out that most classification schemes appear to rely solely on the physical aspects of care, neglecting aspects of nursing related to emotional support, teaching, and comfort. Finally, Aydelotte felt that little effort had been made to assess interrater reliability and the application of the systems to a variety of different settings.

The Medicus report by Jelinek et al. (1976) examined patient classification methodologies as technical systems that influence the productivity of nurses and reviewed a number of the earlier studies mentioned by Abdellah and Levine and by Aydelotte. Jelinek et al. concluded that while there were gaps in the application of patient classification systems to psychiatric patients and other than acute care facilities, the positive impact of patient classification and workload methodologies on the organization and administration of patient care units had been demonstrated in a number of studies. Specifically, they referred to the cost savings achieved through balanced staffing and concluded that patient classification and workload information provide important data for long-range budgeting, scheduling of admissions and elective surgery, and the assignment of nurses. Quality of patient care, the evaluation of nurse assignments, and the practice of relating patient care charges to level of care provided, were suggested as areas where the impact of patient classification needed further investigation. On the basis of this review, Jelinek et al. made the following recommendation:

> Determine required staffing using an appropriate methodology adapted to the institution; compare with actual staffing, and plan for orderly staff adjustments, as necessary (p. 57).

Giovannetti (1978), on the basis of works cited by Aydelotte and a review of the literature up to 1977, provided a comprehensive state-of-the-art evaluation of the concepts and the designs of patient classification and described a number of systems currently in use. She stated that implementation had by that time occurred in well over 1000 hospitals and commented on systems implemented in medical-surgical settings as well as various specialized units. In addition, she discussed major issues in the selection and development of patient classification systems, such as critical indicators of care, quantification techniques, and reliability and validity. Patient classification systems were described as planning tools for the deployment of nursing resources which can significantly enhance their effective and efficient utilization. Giovannetti's review suggested that to some extent, Aydelotte's concerns had been addressed. While debate continued over the relationship between care provided and the actual care needs of patients, there appeared to be much greater nursing involvement in the development and verification of the quantification coefficients. The inclusion of patient classification indicators relating to emotional support and teaching was more often found to be the rule than the exception in most of the systems reported. Finally, there was evidence that the systems had been applied to a wide variety of settings and that issues of reliability were beginning to be recognized.

In response to the issues raised by Jelinek et al., Giovannetti's review also included applications to psychiatric patients and some long-term care facilities. In addition, a number of references dealing with the application of patient classification systems to the practice of charging patients by level of care were cited.

In general, then, the literature reviews reflect the wide range and amount of work published during the 1960s and 1970s. Several themes were dominant: the methodological development of classification instruments, the application of a wide variety of approaches to the quantification of nursing care time, exploration of multiple uses of classification, and expansion beyond the medical-surgical setting. Case histories of successes and failures were frequent, and questions were raised by some authors as to whether or not the concept was even appropriate to the delivery of professional nursing care.

Since 1978, the literature devoted primarily to patient classification has declined sharply. However, references to patient classification are often found in literature relating to other aspects of nurse staffing. Patient classification is frequently used as an independent variable in research projects and is discussed peripherally in the literature on cost containment, quality monitoring, and management information systems. Only literature dealing primarily with patient classification is reviewed in the following. It should also be noted that while a potential literature source is the work of consulting firms, which are heavily involved in the adaptation and implementation of patient classification systems in acute care hospitals throughout the country, such literature is excluded from this review because of its general lack of accessibility.

In the following, a brief overview presents the clearly descriptive literature. While the remaining literature has been classified as research, it is recognized that the nature of the topic does not lend itself easily to hypothesis testing; with few exceptions, therefore, the literature does not represent research efforts based on rigorous experimental designs.

DESCRIPTIVE LITERATURE

A number of articles elaborated on the methodological issues of patient classification mentioned by Aydelotte (1973) and Giovannetti (1978). Tilquin (1977) responded to several common criticisms of patient classification and recommended that greater attention be paid to the methodologies used in development of classification instruments. In a general article on patient classification systems, Giovannetti (1979) discussed some of the major methodological issues crucial to the development, understanding, and usefulness of patient classification systems. They included the number and scope of critical indicators of care, approaches to the quantification of patient care, reliability and validity testing, and the relationship to quality of care. She concluded that patient classification systems, when appropriately developed and used, serve as an important aid in the effective determination and allocation of nursing resources.

Many of these methodological issues were also discussed by Hanson (1979). He pointed out that the transfer of patient classification systems from one setting to another was difficult because of the complexity of the conceptual framework relating to nurse staffing; only where patient populations were similar could successful transfers be made. Hanson commented that the selection of variables for classification (the critical indicators of care) is based not only on their contribution to the statistical validity of a classification instrument, but on their subjective desirability. Emotional support and teaching were cited as examples of variables that, although not necessarily statistically predictive of patient requirements for care, needed to be retained because of their clinical value to nursing and their contribution to system credibility among nurses. This issue was also discussed by Giovannetti (1978, 1979); the work of Hinshaw, Verran, and Chance (1977) discussed in the next section contains findings specific to this point.

The need for greater attention to reliability among nurse classifiers was again emphasized. Finally, commenting on the fact that care categories are not mutually exclusive and that overlap of categories in terms of nursing care time is common, Hanson reiterated that the issue is one of determining the amount of overlap that is acceptable without compromising the purpose of the system.

Vaughan and MacLeod (1980), in discussing nurse staffing studies, argued that little progress has been made since the early research of 20 years ago. They referred specifically to the fact that present custom-made systems do not lend themselves to comparisons of nursing staff efficiency among hospitals or with nationwide norms. They mentioned as related problems the multiplicity of classification schemes used among hospitals; the gray areas between patient categories within a hospital; the tailoring of workload analysis systems to individual hospitals; difficulties in updating systems when changes occur in methods, physical unit layout, equipment, or redistribution of activities to other departments; and the lack of verification that patient classification is in fact accurate.

A number of recommendations were offered by Vaughan and MacLeod, among them the use of standard time data modified for individual institutions to allow for specific quantifiable characteristics such as different food service systems, medication systems, or physical layout; the adoption of a nationwide standard for determining who are to be considered as providers of care; and standardized terminology for hours per patient day. The writers criticized current patient classification systems because of their lack of discrimination between categories. They suggested that clear distinction between classes should be made by using concrete breakpoints to represent the range of hours per patient day and midpoints to represent the average hours per patient day.

While their recommendations regarding standardized terminology have been frequently made by others as well, their criticism of existing patient classification systems appears to be based on two selected studies that are not representative of the many well tested systems available.

A discussion of some of the methods for quantifying direct nursing care times pursuant to patient classification is provided by Williams (1977), who pointed out advantages and disadvantages of self-recording, continuous observations, and work sampling procedures for measuring direct nursing care time. In addition, issues such as the relationship between care provided and care required, and the promotion of an industrial efficiency model of nursing care resulting from emphasis on the time factor in nursing practice, are discussed. While the author concluded that none of the methods for quantification is without disadvantages, they yield the hard data that are necessary and useful for staffing and budgetary purposes.

The application of patient classification systems to hospital billing systems appears to be growing. LaViolette (1979a) suggested that the use of such systems as the basis for billing patients for actual nursing services received may become an integral part of hospital billing systems in the future. Such procedures can eliminate the inequities of flat-rate billing, ensure adequate reimbursement for nursing expenses, and boost nursing morale. The positive experiences of three medical centers where classification-based billing systems had been implemented were briefly discussed. A fourth hospital reportedly dropped its plans to initiate a patient classification billing system because the validity of its recording methods and time values was questioned by third party payers.

In summary, of the descriptive articles reviewed, four dealt with methodological issues suggesting that, through experience with patient classification, many earlier problems in its development and understanding need not hinder successful implementation. The standardization of terminology and the value of comparable approaches to quantification were emphasized. One article was devoted to different quantification approaches and one discussed the increasing use of classification systems for patient billing.

RESEARCH LITERATURE

As noted, the literature classified as research for purposes of this review departs from the usual testing of hypotheses that characterizes most of the research literature reviewed in other chapters of this monograph. Three articles deal with adaptation and refinements of previously developed and tested systems, and three works offer slight variations in the approach to classification and the resulting staffing systems. These articles are presented as research efforts because they have relied at some point on data collection and analysis. In most cases, the secondary references that provide the research methods are cited. Other research literature reviewed covers a wide variety of topics, i.e., two studies identifying classification variables; a study of the relationship between subjective and objective measures of staffing adequacy; an intrainstitutional comparison of alternative classification instruments; and an interinstitutional comparison of nursing care requirements.

Cochran (1979), reporting on the system at St. Joseph's Hospital in Albuquerque, described how the hospital's four-category prototype patient acuity system was refined to meet relevant patient care needs. The hospital had originally implemented the classification instrument with definitions of categories unique for each area of service. The refinement resulted in a single set of acuity descriptions that were broadened to encompass illness levels on all nursing units. Standards of care were defined by nursing hours devoted to the patient described within a category. The setting of acuity standards was done within budgetary goals and essentially involved negotiation with nursing personnel, coupled with work study sampling. The author suggested that the formulation of a plan for continuous monitoring and refinement which includes participation of nursing staff is necessary to assure that the system continues to be effective and acceptable. The details of the refinement process and monitoring system were described.

Refinements at the Misericordia Hospital in Edmonton, Alberta, also resulted in the development of a common classification instrument for use throughout the hospital (Youell 1979). The original four-category factor evaluation instrument, which was designed after the system developed at the Hospital Systems Study Group (HSSG), University of Saskatchewan (1968), was modified to incorporate criteria appropriate to the hospital while reflecting degrees of constant nursing care. Weights were assigned to each category of care based on a subjective observation of head nurses. The refinement program also included the development of a categorization system for all nursing staff based on their ability to contribute directly to patient care. For example, nursing assistants were given a lower weighting than registered nurses due to limitations in their job function. Consistency in the interpretation of the classification criteria was to be ensured through weekly monitoring by unit supervisors and nursing auditors.

A recent publication from the Hospital Systems Study Group introduced refinements to their four-category classification instrument and modifications of the guidelines for the interpretation and selection of indicators (Jackson and McKague 1979). The manual had been introduced to aid hospitals in implementation of the HSSG patient classification system (Sjoberg and Bicknell 1978). Modifications of the guidelines permit expansion of the patient classification instrument to medicine, surgery, obstetrics, long-term care, pediatrics, and nursery. The changes were an outgrowth of several years of experience by user hospitals and of data collection in a long-term care setting. No data were provided to justify the changes, although reference was made to supporting documents. Revised forms as well as procedures for reliability testing and for monthly and yearly cumulative information reports were included.

The GRASP system for determing patient requirements for care described by Meyer (1978a) represents a slight departure from the more common patient classification systems. Its methodology stems from the works of Poland et al. (1970) and Clark and Diggs (1971). The system involves determination of the care needs of each patient by the establishment of standard care times for over 40 physical care activities, representing 85 percent of all physical care; the remaining 15 percent are covered by a constant. Total patient care requirements are computed by the addition of constants representing indirect care, teaching and emotional support, and a delay and fatigue factor.

The author reported that extensive time and frequency studies were undertaken to identify the significant areas of nursing care. Time standards for each care activity were determined through in-depth time and frequency studies made at Grace Hospital in Morganton, North Carolina. Details of the methodologies employed were not provided, although it was recommended that user hospitals modify the standard times as needed to account for variations in their settings.

For convenience, the standard time values are converted to points which in turn are converted to hours of Patient Care Units (PCUs). All PCUs are rounded to the nearest hour. The methodology provides an assessment of individual patient care activities that, when totaled for a nursing unit, can be compared with the nursing care hours available; these are expressed as Nursing Care Units (NCUs). The system advocates the adjustment of workload to staffing, the reverse of most practices, by assigning patients at the time of admission to units that have the lowest PCU count compared with available NCUs. A self-help manual is available to assist hospitals with time study procedures for determining relevant standard times, and identifies the steps and forms necessary for hospital-wide implementation (Meyer 1978b). This document also reports on the development and operation of the system.

The varied uses of patient classification systems were also cited for the GRASP system; e.g., assignment of patients to units, adjustments in staffing among units, the use of float personnel, and the encouragement of vacation days were offered as solutions to maintaining balanced workloads. Use of the system for budget preparation, cost accounting, and charge systems was described. The GRASP system differs from the commonly used patient classification systems in that care requirements are identified for each patient rather than for representative groups of patients. Whether this degree of precision makes a significant difference in terms of the total nursing care time required and the allocation of staff was not demonstrated.

A nurse staffing system based upon assignment difficulty represents another modification of the measurement of patient care requirements for nurse staffing determination. As reported by Norby, Freund, and Wagner (1977) the approach is based upon the philosophy underlying traditional approaches but uses different measurement methods for determining staffing needs. Specifically, workload and the staff's capacity to accept workload are measured in terms of difficulty instead of time.

A four-category factor evaluation patient classification instrument is used for determining the self-sufficiency of patients. Each condition indicator is supplied with a predetermined weight ranging from one to eight. The weights of the selected indicators are summed, and the patient is placed in one of the four care categories on the basis of the resulting score. Activity groups for each level of patient acuity are defined and measured in terms of "assignment element" difficulty. According to the investigators, the use of activity groups is intended to provide a common frame of reference and to eliminate the problem of specifying separate tasks. Moreover, the activity groupings can be established for individual institutions, units, and shifts to reflect current policies and procedures.

Nursing staff assignment elements are identified by structuring all possible combinations of activity groups and all patient classification categories, e.g., medications for a self-care patient; treatments for a complete-care patient. In this manner, both the acuity level and the activity groups required for each patient are considered simultaneously. Data to assess the validity and general applicability of the new approach were not provided. Also, the investigators did not demonstrate whether the degree of precision made an important difference in the staffing outcome.

Another modification in the approach to patient classification stems from research conducted at the University of Montreal and area hospitals. Chagnon et al. (1978) discussed the development of a classification instrument, referred to as PRN 76, which was generalized to all types of patients except psychiatric ones. The new classification system was adapted from previous research which had resulted in the development of PRN 74, a pediatric classification system (Chagnon et al. 1975). The investigators claimed that the system is applicable to all types of health care institutions.

The classification instrument contains well over 100 nursing interventions grouped under the usual classification indicators relating to hygiene, feeding, elimination, respiration, supervision and observation, and therapy. The list of interventions was tested for context independence, exhaustiveness, specificity, and mutual exclusion, using the experience of over 100 members of the nursing staff. Each intervention was weighted normatively in terms of the number of minutes of direct and indirect care it required in a 24-hour period. The weights were developed by nurses and physicians and represent an estimate of the average time it takes to perform the intervention under normal conditions. Thus, each intervention is associated with a time value. Up to this point, the system is similar to the GRASP system: the values associated with each intervention required by a patient may be added to provide an estimate of the workload. The PRN system, however, further developed their classification system by setting arbitrary boundaries, based on the number of minutes of direct and indirect care, for each of five care classes.

The final stage in the development involved establishing weights for each patient class. To obtain the value of a class, the average care time of a sample of patients within each class was calculated.

On the basis of work sampling data, coefficients representing an indirect care component relating to communications, medical records, and care plans were estimated for each patient category. To permit determination of shift staffing requirements, the total time values were distributed among the three shifts.

The authors argued that the use of the normative approach to establishing care times has advantages over approaches that are based on actual time measurements. They claimed that the latter method centers on care required rather than care given. The argument is weakened, however, by the admission that validity testing of the PRN system involved checking whether the workload calculated is equivalent to the actual workload on the unit.

A second article on the development of the PRN 76 classification system described the data processing subsystem designed to determine the staffing size and composition of a nursing unit (Tilquin et al. 1978). Historical data on the number of staff required for each day of the week were accumulated and arranged into tables, graphs, and histograms to aid in decision making.

A well designed and controlled study reported by Rhys-Hearn and Potts (1978) investigated the effect of specific individual patient characteristics upon activity times for items of nursing care. The study, conducted in a hospital in Great Britain on seven geriatric wards, was planned to test the hypothesis that patient care categories and patient dependency factors have a significant effect upon nursing workload. Four patient care categories, ranging from total self-care to total dependence, and ten dependency factors such as obese, frail, uncooperative, and confused, served as independent variables. Direct patient care time was measured by work measurement techniques for all nurses for a one-week period.

Analysis of variance indicated that both patient care category and dependency factors influenced the amount of direct care provided to patients. Multilinear regression analysis was used to quantify, for staffing purposes, how care category and number of dependency factors affected activity times.

While the findings are limited to the study population, the study did reveal that in addition to patient care categories, selected patient dependency factors represent predictive indicators of required nursing care time for geriatric patients. It was also found that the duration times of each activity for patients in the same category and having the same dependency factors exhibited a wide variation. The authors concluded that while it was possible to determine patterns in activity times as related to groups of patients, it was not possible to predict activity times for individual patients. The variations between individual persons were considered too complex to be categorized by a few attributes. This study provides yet another validation of the concept of patient classification in general and suggests that for geriatric patients the addition of information on dependency factors may be important for predicting overall patient care time requirements.

A study to identify the patient classification variables that, according to nursing judgment, are most relevant in evaluating the time requirements involved in patient care was reported by Trivedi (1979). A 27-item classification instrument was constructed by adding 15 nursing care items to the original classification instrument reported by Connor et al. (1961). The added items were deemed essential by the nursing supervisors of the study hospital, a 300-bed suburban acute care general hospital. Data were collected on the day and evening shifts for a two-week period on a 68-bed surgical unit; over 600 patients were observed. During each shift the head nurses recorded the classification variables appropriate to each patient along with their estimate (in terms of low, medium, and high) of the amount of nursing care delivered to each patient during the shift. Limitations of the Trivedi study were that it used only two head nurses and that it was not clear whether they based their evaluation on care given or care required. The study also did not report any efforts to validate the amount of nursing care reported, or to establish observational reliability between the head nurses.

Analysis of variance used the subjective opinion of the head nurse regarding the amount of care time required as the dependent variable. On the basis of this analysis, the investigator concluded that only a small number of classification variables were necessary to categorize patients. Moreover, the findings identified different sets of variables for the day and evening shifts. The investigator conjectured that for different nursing units, different sets of classification variables should be used. The latter point contradicts the work of Cochran (1979) and Youell (1979), who reported on the movement towards one classification instrument for all patient care areas. The contradiction may be explained in terms of the degree of literal translation employed. It appears that in the Trivedi study, the classification variables were selected according to the major nursing activities carried out on each shift. The classification variables used by Cochran and Youell, while representing major nursing activities, served more as indicators of care, and an accompanying set of definitions or guidelines for the interpretation of indicators was used to establish a common frame of reference and to enhance continuity from nurse to nurse and from patient to patient.

Williams and Murphy (1979) examined the relationship between charge nurses' subjective evaluations of staffing adequacy and quality of care and selected objective measures of the same factors. Their investigation was part of a larger study aimed at the development of methods for the use and effectiveness of nursing personnel (San Joaquin General Hospital 1976). Recognizing that charge nurses have historically been relied upon to judge the adequacy of staffing as well as the adequacy of care, the investigators wished to determine if the nurses' professional judgment of both these elements accorded with that of more objective measures. A strong relationship would suggest that professional judment is one reasonably valid indicator of the staffing levels needed to provide various levels of direct care services.

The study was conducted on four nursing units in a 316-bed private hospital and on two nursing units in a 260-bed county hospital. Four data collection sources were used: a questionnaire completed by charge nurses at the end of their shifts; records of patient census, patient classification, and staff available on each shift; observation by nurse observers; and patient records. The charge nurse questionnaire elicited an evaluation of staffing adequacy and levels of direct care provided. Four possible judgments of staffing adequacy were possible, ranging from "more than adequate" to "inadequate." The respondents were also asked to indicate their reasons for judging staffing as inadequate and to note what additions in staff would have relieved the situation. The level of direct care provided was determined on the basis of ten questions, including items relating to basic hygiene and the completeness and timeliness of carrying out medication and other procedures. A five-point Likert scale ranging from good to poor was used for recording the charge nurses' perceptions.

Patients were subjectively classified into three categories of care by the charge nurse on the preceding shift. This subjective assessment was considered valid on the basis of significant differences in the amount of care provided between patient categories; the validation process was part of a larger study not reviewed here. Nurse observers were used to measure patient waiting time, which served, along with the frequency of analgesics, tranquilizers, and sedatives, as an objective criterion.

For purposes of analysis, the mean values for perceived levels of direct care services, patient waiting time, and frequency of drug administration were computed under only two conditions of staffing, adequate and inadequate; judgments of "more than adequate" and "adequate" staffing were combined, as were those of "barely adequate" and "inadequate." Differences in means were tested for significance by t-tests.

Of the 204 shifts on all six study units, 132 were judged adequately staffed and 72 were judged inadequately staffed. The ratings for perceived levels of care provided in the ten care categories decreased significantly under inadequate staffing conditions. Moreover, the results indicated that nurses establish priorities in delivering care. The activities most often affected under inadequate staffing conditions were "communication with patient and/or family" and "observation of the patient." The activities most often judged not affected were medications and IVs. These findings should be interpreted with caution, however, since, as pointed out by the investigators, it is possible that the charge nurses' overall judgment of staffing adequacy biased their judgment of the level of direct care provided.

The analysis of patient waiting time and the administration of analgesics, tranquilizers, and sedatives was based on 155 patient days on only two of the study units, a coronary and postcoronary care unit. While the findings were inconclusive, patient waiting times for nurses' response to call lights showed promise as a measure of staffing inadequacy.

Census, staff hours available, and number of maximum care patients were all compared under adequate and inadequate staffing conditions and found not to be important in and of themselves in influencing perceptions of staffing adequacy. On the other hand, staff hours available per patient and per maximum care patient were associated with perceived levels of staffing inadequacy and may serve, in part, as an index of the nursing staff's ability to provide services.

This study, which focused on professional judgment, represents an effort to provide measures that can form part of the complex data base required for staffing decisions.

A pilot study testing three different factor evaluation classification instruments was conducted by Roehrl (1979) at the Medical Center Hospital of Vermont. The three procedures, which categorized patients into four categories, included one developed at the study hospital, the instrument reported by Hanson (1976) and subsequently by the San Joaquin General Hospital (1976), and an instrument developed at the University of Saskatchewan as reported by Giovannetti (1970). The findings of the seven-week pilot study, based on a sample of 779 medical and surgical patients, were that the highest correlation (.64) was achieved when two outside classification instruments were compared with each other. When considering a two-classification difference, agreement between the two outside instruments increased to .99. The length of time needed to complete the classifications was also noted. The outside instruments took 12 and 15.5 minutes, respectively, to complete, while 27.5 minutes was reported for the study hospital's classification instrument. These findings, while limited to the study setting, represent one of the first attempts to determine the outcome of the selection of different patient classification instruments on the distribution of patients between categories. For the study hospital, the findings suggested that the development of classification instruments unique to a facility was not necessary, and that more than one system could be used for interhospital comparability.

An interorganizational study reported by Hinshaw, Verran, and Chance (1977) represents a significant contribution in the area of identifying differences in nursing care requirements among various hospitals. The study took place in Arizona and, employing patient classification as an independent variable, compared nursing care requirements in six hospitals representing five different organizational types: one county hospital, two private community hospitals with religious affiliations, one general hospital in a retirement community, one community medical center, and one university hospital. Three research questions were of interest: (1) do requirements for nursing care vary in different types of hospitals; (2) do nursing care requirements of patients in teaching hospitals differ from those treated in private community and county hospitals; and if so (3) on which major dimensions do the requirements vary?

The nursing care requirements in each of the hospitals were measured for all clinical services by a patient classification scale (PCS) developed by the Arizona University Hospital Nursing Department (Berry 1977). The scale represents a factor evaluation instrument designed to measure the complexity of nursing care on eight major care groupings such as activity, hygiene, feeding, medications, vital signs, treatments, impairments, and emotional problems, and six other variables including postoperative, admission, and surgery status. Nine predetermined weights established by a panel of clinical specialists served as indicators of the complexity of the care involved for each of the 14 factors. Extensive reliability and validity testing of the instrument had previously been reported by Berry (1974) and was carried further as part of this study, i.e., for intrainstrument and interrater reliability, criterion validity, and generalizability to a variety of clinical services. Intrainstrument reliability was estimated by testing the scale items for internal consistency, and an acceptable range of coefficients was identified after deletion of the indicator relating to emotional needs. The Johns Hopkins Classification System (Connor 1961) was used for Berry's criterion validity studies. Further criterion validity work was carried out to estimate the completeness of the eight care groupings and the relative efficiency of the weighting system.

Nursing care requirements in the six hospitals were measured by sixteen raters using the PCS and the Johns Hopkins instrument. At the conclusion of a training period, independent ratings of the nursing care requirements on a small sample of patients revealed no significant differences among raters. Data were collected concurrently in the six hospitals for 12 days, resulting in the recording of over 15,000 patients days.

The mean value of nursing care required for each major care grouping was determined across the six hospitals. In regard to the first research question, significant variations in nursing care requirements across the different hospitals were evident. Furthermore, the university hospital was found to have the same or greater nursing care requirements than the other hospitals in the categories of emotional problems, treatments and medical orders, and the administration of medications, and the same or significantly lower nursing care requirements in the other five categories. It should be noted that throughout the analysis, the category of emotional problems and the category of impairment, which related to communication with a patient or his family, did not appear to have a significant influence on the total classification instrument.

To answer the third research question, the investigators determined that four of the major care categories represented routine activities and the remaining four represented other than routine activities, using Perrow's (1967) technological perspective as the theoretical model. The data representing the latter four categories revealed that the university hospital had greater nursing care requirements than several of the other hospitals in three of these, i.e., emotional, treatments and medical orders, and administration of medications. These non-routine activities were considered to be less standardized and to be less predictable in nature, requiring more professional nursing staff.

The limitations of the study relate primarily to a lack of generalizability, as the six hospitals selected were not representative of a random subset. Other limitations noted by the investigators included the absence of information on indirect care activities and complexity of the health team.

SUMMARY AND IMPLICATIONS: PATIENT CARE REQUIREMENTS

A large body of literature exists regarding patient classification systems and their use for allocating nursing personnel resources. Four previous literature reviews covered a large share of the work in the field. Despite the multitude of issues and debates that characterize much of this literature, there is growing acceptance of the appropriateness of the concept and it is being widely implemented. It would appear that consensus has been reached on a number of counts. Patient classification procedures, while not a panacea for all the challenges of nurse staffing, represent an improvement over the traditional approach, which relied heavily on fixed staff-to-patient ratios. The procedures identify and provide alternative solutions to meeting the variable demand for care on nursing units from day to day and from shift to shift. Long-term budgetary planning is improved by the aggregation of more precise data at the unit level. The timely allocation of nursing personnel resources in response to patient requirements for care offers potential for improving the quality of care and the monitoring of costs.

In summary, several approaches are available for quantifying patient requirements in terms of nursing care time, patient care categories, and related factors. There is general agreement that coefficients developed in one setting are not necessarily transferable to another setting, but the best or most appropriate approach to quantification continues to be a subject of debate. The selection of a particular methodology for quantification is complicated by philosophical issues as well as factors of cost, time, precision, and flexibility.

The content and number of indicators or variables selected as the basis for classification varies little from one instrument to another. While the number of indicators required for statistical validity is in fact small, additional ones are frequently incorporated to enhance user acceptability or to expand the use of the instruments. It would appear that the guidelines for interpreting the indicators which accompany most instruments are an integral part of the system and serve to enhance generalizability and agreement within an institution.

The establishment and continued monitoring of reliability and validity of classification instruments is generally recognized as integral to their usefulness and acceptability. Factor evaluation systems have tended to be the system of choice and lend themselves to fairly direct reliability and validity measures.

On the other hand, the relationship between the use of patient classification systems and the quality of nursing care remains to be clearly defined. The absence of well developed outcome measures in nursing constrain the identification of the relationship between patient requirements and nursing resources. Efforts in this area are continuing and likely to be expanded. The Joint Commission for Accreditation of Hospitals (1979) referred indirectly to the use of patient classification systems in defining their nursing standards for 1980, by requiring that "The nursing department/ service shall define, implement, and maintain a system for determining patient requirements for nursing care on the basis of demonstrated patient needs."

OPERATIONAL FACTORS: MANAGEMENT AND ORGANIZATIONAL MODES OF NURSING

Operational factors have been defined as those methods or procedures in the delivery of nursing care that serve to convert available input into a desired output. As shown in the conceptual framework in Figure 2, these factors have been separated into those related to the actual management of nursing care and those related to the organizational mode of nursing. To a large extent, the organizational mode of nursing reflects the philosophical approach to nursing care, while the management of nursing comprises the specific procedures and techniques used to translate nursing philosophy and policy into effective operating practices.

Fundamental to the delivery of care are the techniques used for patient assessment and patient classification as a means for determining staff allocations and assignments. This aspect was discussed as an input factor in Chapter 5, although as a routine procedure, it may be viewed also as an operational factor. An extensive body of literature exists concerning other management factors, such as administrative sophistication, leadership abilities, and organizational relationships. However, little specific attention has been paid to the way in which these factors affect nurse staffing. Similarly, a great deal has been written about the care planning process; here, too, very little can be found that relates this factor to staffing issues.

Chapter 6 includes those factors that have been considered in the literature: nursing service organization, unit management, scheduling, and the modified work week. As will be seen, much of the literature is descriptive rather than evaluative, and in most cases the interrelationships of these factors with input, output, or environmental factors ave been inadequately studied.

On the other hand, a growing body of literature exists concerning organizational modes of nursing, especially as related to primary nursing care. Chapter 7 concentrates on this factor. Again, most of the recent literature was found to be descriptive; little evaluative research exists that rigorously assesses the potential impact of a move to primary nursing care on many of the other factors in the framework of nurse staffing in acute care hospitals.

Chapter 6

OPERATIONAL FACTORS: MANAGEMENT

NURSING SERVICE ORGANIZATION

Nursing service organization can be defined as the administrative structure within which the individual nursing units of a hospital operate. It encompasses the responsibility, authority, communication, and decision-making patterns of nursing personnel above the unit level. Two major types of nursing service organization -- centralized and decentralized -- are recognized. A centralized nursing service is usually one in which all clinical nursing areas throughout the hospital are controlled by a single nursing authority. A decentralized nursing service characteristically has a director with full decision-making authority at the head of each clinical nursing department. A trend toward decentralization of nursing authority in hospitals has occurred in the last decade (LaViolette 1979b).

The literature on nursing service organization with any relevance to nurse staffing issues is not extensive. In their review of the literature on nursing productivity, Jelinek et al. (1976) cited twelve works from the late 1960s and early 1970s which discussed the impact of an administrative change like decentralization on nursing and enumerated the potentially positive effects of such a change. While pointing out that there have been no studies of the outcomes of decentralization, and that research is needed to learn which are the most effective organizational types, Jelinek et al. nevertheless recommended that, where administrative and organizational factors allow it, decentralization should be considered.

Some articles on decentralization of the nursing service have appeared since, but virtually none appear to have been written specifically on the centralized nursing organization. Furthermore, articles on decentralization do not explicitly address the effect of the type of organization on staffing. Instead, it appears that factors associated with a changeover to a decentralized structure, such as unit management, primary nursing, patient classification systems, and a redefinition of supervisory roles (all of which could also occur under a centralized structure), affected staffing more than the specific type of organization.

This section is, therefore, restricted to a discussion of the literature on decentralization of the nursing service organization. In addition, articles on nursing service reorganization which touch on

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decentralization are briefly mentioned. Finally, several articles on an alternative to centralized and decentralized structure, known as matrix organization, are reviewed.

DECENTRALIZATION

Descriptive Literature

Two articles on decentralization discussed the subject in strictly theoretical terms. Marriner (1977) defined decentralization as "the degree to which decision making is diffused throughout the organization. It is relative, for the degree of decentralization is larger when more important decisions affecting more functions are made at lower levels and with less supervision" (p. 37). Marriner felt that the following potential advantages of decentralization to nursing organization would outweigh possible disadvantages: increased morale, promotion of interpersonal relationships, increased informality and democracy in management, more effective decision making, increased flexibility, decreased reaction time, easier determination of accountability, and more effective utilization of human resources. Possible problems in implementing a decentralized structure were difficulty in dividing an organization into self-contained operating units, the reluctance of top administrators to delegate authority, competition between divisions in the organization, and increased cost due to a growth in management and staff positions. Marriner pointed out that a basic concept of effective decentralization is delegation of work. Three additional but related concepts -- assignment of responsibility, delegation of authority, and creation of accountability -- were also explored.

A second theoretical article, which made more explicit reference to nursing issues, was by Fine (1977), who argued that business principles of organization and administration are applicable to nursing. She pointed out that since both businesses and hospitals are increasingly complex organizations with intensive technologies and turbulent, uncertain environments, both can benefit from decentralization. Fine felt that a decentralized organizational structure can expand nursing power in the hospital. If the goals of nursing service are accepted by the staff, "each staff nurse then becomes an emissary for nursing and the care component is increased by each nurse" (p. 66). She concluded that decentralization can bring together the top and bottom levels of the nursing organization, and can reverse the tendency of staff nurses to disassociate themselves from the nursing department, since each nurse in a successfully decentralized organization experiences nursing goal continuity and congruence.

Morgan (1973), in an article on nursing service organization and management, also discussed decentralization and argued that more nursing departments should shift from a centralized structure to a decentralization of authority. Morgan recommended that before deciding on the most appropriate organizational structure, the nursing department should consider hospital and department goals, type of hospital and nursing service, types and needs of patients, organization and delegation of non-nursing activities, personnel policies, and staffing patterns.

In another general article, LaViolette (1979b) discussed the change of many nursing departments from matriarchal, autocratic, and militaristic centralized structures to democratic structures in which management authority is shared by the nursing staff. LaViolette recounted the opinions and experiences of several nursing directors, all of which strongly supported decentralization, and quoted one of them as considering a centralized authority structure to be incompatible with primary nursing. A decentralized authority structure was seen as an evolutionary process, a stimulant to new ideas, and an influence on nurses to feel a stronger commitment to functioning efficiently and productively.

There are also a number of articles presenting case studies of decentralization in various settings. Howe (1969) described the decentralization of patient care administration at Ohio State University Hospitals, but focused on hospital-wide changes rather than specific changes in nursing service. The decentralized system at that institution was implemented to reduce the distance between department directors and patients and to counteract the vertical growth of departments. The author claimed that decentralization was especially beneficial to the director of nursing, because among other important issues, it permitted her to give attention to the duties of nursing personnel, the development of nursing specialists, the study of personnel practices, and research into the quality of care.

Among case studies of decentralization focusing specifically on the nursing department is that by Marciniszyn (1971), who reported a hospital decentralization project which was to bring decision making, responsibility, authority, and accountability to the operational level. To improve the quality and quantity of nursing care, the nursing department, formerly organized within a rigid hierarchical structure, chose to adopt a decentralized structure corresponding to that of the hospital. The author discussed the problems encountered in the reorganization and steps taken to solve them, and concluded that decentralization, although not a solution to all nursing problems, did make the patient the focal point of activity. Stitely (1973) described the decentralized nursing service at Allegheny General Hospital, Pittsburgh, Pennsylvania, where each major clinical speciality became a division under a division head, and each patient care area became a unit under a clinical supervisor's direction. An important advantage of the system was the delegation of decision-making authority equal to the responsibility delegated. Under the decentralized system, staff nurses, through the division head, were able to participate in planning and implementing programs affecting nursing practice, patient care, and productivity.

Mahowald, Freeman, and Dietsche (1974) reported on their experiences with a decentralized nursing department at St. Luke's Hospital, Marquette, Michigan. The centralized nursing structure there had been felt to be inimical to creative practice, and a decentralized system was introduced in which nursing authority was assigned closer to the operational level. Four separate nursing departments, each corresponding to a clinical area and with its own director, were created. Since each director was located on a unit in her clinical division, physical distance between director and staff was reduced, responses to patient and staff problems took less time, and scheduling of personnel became easier. Decentralization made each nursing staff member more responsible for her actions.

Several case studies described decentralization as only one component of a major change in nursing; none drew major conclusions about the impact of decentralization. Nehls et al. (1974) and Miller (1979), for example, discussed decentralization in conjunction with the introduction of primary nursing at their hospitals. Similarly, Osinski and Morrison (1978) described a change to decentralization which occurred simultaneously with the implementation of primary nursing, staffing with registered nurses only, cyclical scheduling, and other innovations (see also Chapters 4 and 7). Simms (1973) described decentralization as a change made in conjunction with removal of hierarchical controls and reassignment of non-nursing functions to unit management personnel, with the goal of removing bureaucratic obstacles to nursing practice. A series of changes made to improve nursing and solve problems of low staffing, high resignations, and low job satisfaction at Springfield Hospital, Massachusetts, was described by Murphy (1967). In this project, steps were taken to improve utilization of part-time nurses, to redesign orientation and in-service training, to upgrade auxiliary personnel, and to increase cooperation with other departments, as well as to decentralize the nursing service into manageable areas.

An early descriptive case study on decentralization by Elise (1966) should be mentioned, which delineated many changes in the nursing service at DePaul Hospital, St. Louis. These included deleting supervisory positions and creating assistant director positions corresponding roughly to the clinical areas of the hospital. Thus, although the author never used the term decentralization, the article appears to be well within the literature on decentralization.

In summary, recent descriptive literature on decentralization of the nursing service contains both general articles on the concept and case studies describing experiences with decentralization in a number of hospitals. Generally positive toward the concept, they did not attempt an objective assessment of the impact of decentralization on nursing.

Descriptive-evaluative Literature

A few descriptive articles on decentralization also provided some evaluation results. Starkweather (1970), although not evaluating decentralization specifically, presented data showing that large hospitals have less control of their operations than do small hospitals, and recommended that large hospitals therefore should adopt a decentralized authority structure. Starkweather's argument was that, as part of this organizational innovation, nursing could be strengthened by greater delegation of authority to head nurses and by placing a chief clinical nurse at the head of each clinical area. Under this arrangement, the nursing director could move from the level of operations to the level of policy making. Starkweather concluded that a decentralized structure could make the hospital more responsive to patients and reduce administrative and clerical burdens on the nursing staff.

In an article more directly relevant to nursing, Rostowsky (1978) presented a case study of the decentralized nursing department at the 500-bed St. Joseph's Hospital, Providence, Rhode Island. Three years after decentralization, questionnaires were administered to all registered nurses, licensed practical nurses, and patient service coordinators with five or more years of employment at the hospital to assess their perceptions and opinions of the system. In general, questionnaire responses revealed very positive reactions of nursing staff members to the system, who found it more conducive to high quality care and nursing growth. Management personnel also reacted positively to the change, and nursing staff morale rose significantly after decentralization became effective.

A case study of decentralization in which other outcomes appear to have been evaluated was presented by the Nursing Staff of the Baker Pavilion at New York Hospital (1973). The authors described the reorganization of their eight-unit medical-surgical department, one of seven clinical departments in the hospital. The reorganization, in which supervisory positions were radically changed and total authority and responsibility for their units was delegated to head nurses, appeared to have been a further decentralization of a clinical nursing area within an already decentralized nursing service. The authors, who did not provide details on their evaluation process, stated that after one year under the new organization the following outcomes were observed: a reduced operating budget, improved patient care, increased head nurse satisfaction, greater ability to handle change rapidly, and improved communication.

The recent descriptive-evaluative literature reviewed was limited to three articles. One general article concluded that decentralization is especially appropriate for large hospitals and delineated the potential benefits to nursing which may accrue from decentralization. Two descriptive-evaluative case studies also presented positive results of decentralization with respect to staff members' perceptions, improved care, and reduced costs. Incomplete descriptions of the evaluation methods used weakened the significance of these findings.

THE MATRIX MODEL

Three articles on the matrix organizational model also appear pertinent in a discussion of nursing service organization. Hurka (1978) discussed the classical organization with a centralized hierarchical authority structure and the behavioral, participatory management approach with a less hierarchical, more flexible structure. As an alternative for many modern health care institutions, he proposes matrix organization, which

> ...represents an attempt to overcome the major weaknesses of both the hierarchical (department) and the participatory (team) structures while capitalizing on their strengths. It provides for both hierarchical (vertical) coordination within the individual departments as well as lateral (horizontal) coordination across departments (p. 16).

Porter-O'Grady (1978) also discussed the applicability of the matrix model to nursing service and found it ideal for a dynamic, growth-oriented nursing organization. He presented an organizational chart for nursing reflecting the matrix model and explored the roles of various levels of nursing personnel in this type of organization. Similarly, Johnson and Tingey (1976) recommended consideration of the matrix model for nursing service organizations, on the grounds that it could lead to improved continuity of care, streamlined communication, limitation of employee encounters with patients, and greater opportunities for nurses to use clinical skills. They concluded that these benefits may in turn lead to better health care and more satisfied nursing personnel.

Brief mention should also be made of a number of articles on the general reorganization of the nursing service. Many of these efforts included some elements of decentralization in authority and decision making. Some articles primarily discussed changes in the administrative structure of the nursing department (Johnson 1968; DeStefano 1968); others focused on the process and outcome of reorganization at the nursing level (Kraegel et al. 1972; Salvekar 1975; Colquhoun and Gregorio 1971; Barham 1976; Ayers, Bishop, and Moss 1969; Santorum and Sell 1973).

SUMMARY AND IMPLICATIONS: NURSING SERVICE ORGANIZATION

Although the literature on nursing service decentralization touches on subjects relevant to nurse staffing, it does not explicitly address the relationship between the administrative structure and the number and kinds of staff needed on the patient care unit. In fact, the literature would seem to suggest that innovative programs and systems associated with organizational changes (either centralized or decentralized), rather than the type of structure itself, have a direct influence on staffing decisions at the unit level.

The descriptive and descriptive-evaluative literature indicates that decentralization may have many desirable outcomes for nursing, including improvements in decision making, morale, job satisfaction, efficiency, productivity, and quality of care. These conclusions remain to be verified by more critical research.

The literature on decentralization and reorganization also fails to link the type of nursing service structure (i.e., centralized, decentralized, or matrix) to the organizational mode of nursing at the unit level (i.e., team nursing, primary nursing, or other modes). One can speculate, however, that the effect of the nursing service structure on the organizational mode would be minimal, and that most of the proposed benefits of decentralization could accrue regardless of organizational mode. Nevertheless, as the literature suggests, decentralization does at least conceptually seem to be most compatible with the primary nursing mode, which emphasizes a decentralization of authority.

A final point which is not explicitly addressed in the relatively sparse literature on nursing service organization concerns the strength of leadership in a decentralized structure. Clearly, the success of nursing service decentralization will depend a great deal on the leadership qualities of the nursing director. The literature suggests that decentralization is often introduced as a response to problems throughout the organization. If weak leadership is a part of these problems, then decentralization may well result in confusion and actually exacerbate the problems it was intended to solve.

UNIT MANAGEMENT

Unit management, also known as service unit management or ward management, is an organizational concept for the administration of hospital patient care units (Jelinek, Munson, and Smith 1971) which was first implemented in a New York hospital in 1948 (Tamez 1975). The literature after 1970 does not discuss how this concept developed, but unit management was at least in part due to the growth of team nursing and to the finding of many nursing activity studies that nurses spent a large proportion of their time on activities not directly related to patient care. As Lambertsen pointed out in her foreword to Jelinek, Munson, and Smith (1971), many studies have shown that "only about 25 percent to 75 percent of the skills of registered nurses are available for patient care services" (p.7).

Unit management programs are generally initiated with specific goals in mind. Munson (1973) mentioned saving money, increasing nurse satisfaction, and permitting a redefinition of nursing roles. Small (1974) identified the need to improve quality of care and alleviate nurse shortages as additional reasons for implementing unit management. Braden (1976) stated that unit management at his hospital was undertaken to foster problem solving at the patient care level. Gupta, Farrell, and Gugnani (1976) identified the creation of a strong administrative structure as the chief goal of their program.

Simms (1973) described the introduction of unit management as one change in a major effort to eliminate the bureaucratic deterrents to nursing practice. Underlying all these objectives is the belief that unit management programs can free the nurse to nurse. The potential effect of such programs on nurse staffing, therefore, deserves consideration.

Unit management programs are intended to relieve nurses of tasks and responsibilities not directly related to the nursing care of their patients. These tasks are to be assumed by the unit manager or his staff. Munson and Heda (1976) have identified three common elements of most unit management programs:

> A transfer of the responsibility for coordinating unit functions from nursing to other staff;
>
> A transfer of tasks not central to professional patient care from nursing to other staff;
>
> Formation of a new organizational unit with its own hierarchy and subdivisions of responsibility on the patient units.

Three basic areas of difference among unit management programs can be distinguished (Jelinek, Munson, and Smith 1971), i.e., the placement of of unit management within the hospital organization, the primary focus of the program, and the specific responsibilities assumed by unit management.

Unit management is usually placed under either the nursing department or the administration of the hospital. This decision may in turn be guided by program focus; as Jelinek, Munson, and Smith (1971) reported, the focus of a unit management program may be to serve nursing, to bring hospital administration to the patient unit, or to serve the patient. Although these orientations are clearly not mutually exclusive, one is usually dominant and at least two are usually present in a strong unit management program.

The specific responsibilities of a unit management program vary from institution to institution. Jelinek, Munson, and Smith (1971) have defined seven basic tasks: (1) handling supplies, equipment, and contacts with the maintenance services; (2) traditional ward clerk activities; (3) transcribing physicians' orders; (4) patient transportation and messenger services; (5) on-unit housekeeping and dietary functions; (6) nonprofessional direct patient care, and (7) on-unit admitting, accounting, and central supply activities. In addition, orientation, training and supervision of clerical and messenger personnel (Hilgar 1972), budgetary monitoring (Condon 1974), and patient advocacy (Braden 1976) may be shifted to the unit manager.

Several literature reviews on unit management exist. Jelinek, Munson, and Smith (1971) reviewed earlier literature within the context of their work on unit management but stated no general conclusions based on this literature. Hilgar (1972) also presented a fairly comprehensive review of the research literature on unit management from the 1950s, 1960s, and early 1970s. She concluded that while research findings from that time clearly showed that unit management relieved the nurse of activities not related to nursing, there was conflicting evidence as to whether nurses spent more time in patient care as a result. In his book on hospital organization research, Georgopoulos (1975) summarized and reviewed a large number of articles on unit management published in the 1960s. Although most of these supported unit management, Georgopoulos drew no conclusions about the worth of unit management programs. Aydelotte (1973) also reviewed unit management literature. She concluded that although the literature implies that unit management is worthwhile, its effects on quality and staffing have not been demonstrated. The Medicus report by Jelinek et al. (1976) reviewed a range of studies on unit management from the 1960s and 1970s, and, like Aydelotte, concluded that research showing that unit management can increase productivity in a cost-effective manner was lacking. They recommended that the decision to implement a unit management program should be preceded by careful study of factors contributing to previous failures.

The following review examines the literature published since 1970, especially that not included in the above surveys. In addition, earlier important research is included.

DESCRIPTIVE LITERATURE

Most recent literature on unit management supports the unit management concept but is purely descriptive and lacks both data and evaluation results. The most common type of article is the "case study" describing the implementation of unit management in one hospital. Williams and Allen (1970), Pechan (1974), and Kauffman (1975) described unit management programs at large medical center hospitals which were considered successful in "freeing the nurse to nurse." Similarly, Simms (1973) and May (1974) presented case studies in which unit management was claimed to be one of three administrative changes that improved nursing practice and optimized nurse effectiveness. Other case studies were presented by Braden (1976) and Farrell and LaCosta (1977), who reported on the success of unit management programs in solving hospital-wide organizational, financial, and managerial problems but did not specifically address the effects of the programs on nursing at these institutions.

In addition to such case studies, the descriptive literature also contained several more general articles on unit management. Walters (1970) discussed the role of the head nurse in a unit management program and postulated that introduction of such a program would allow head nurses to return to direct patient care, increasing their job satisfaction and alleviating shortages of staff. Rosenkrantz (1974) provided a general picture of the unit manager's role and enumerated the many duties of which the nurse could be relieved. Jokerst (1975) examined four essential elements of unit management -- purpose, organization, leadership, and commitment. He concluded that while nursing services can influence the efficiency of patient services by introducing unit management, this will not free the nurse to nurse unless the administrative aspects of their departments are first reorganized and developed.

In summary, the descriptive literature mainly consists of case studies discussing the positive effects of unit management both on nursing and on the hospital as a whole. Even among the more general articles on unit management, only one suggested that the goal of unit management programs of "freeing the nurse to nurse" may not be attainable unless administrative changes are made.

DESCRIPTIVE-EVALUATIVE LITERATURE

A small number of descriptive articles also reported some evaluation efforts. Small (1974) presented a brief case study of unit management at St. Thomas Hospital, Nashville, where unit management was introduced to assume nursing's clerical and administrative tasks and was placed parallel to nursing under the hospital administration. Quality and amount of direct patient care were measured before and one year after implementation of the program. Quality was measured with an index developed by the University of Michigan for another unit management study (Jelinek, Munson, and Smith 1971); a work sampling technique was used to determine the percentage of time different types of nursing staff spent on various activities. Staffing costs were also monitored over time. After one year of unit management, quality of care was found to have increased by 13.5 percent and overall direct patient care provided by the nursing staff by 15 percent. The nursing units were found to be operating at a savings of over $23,000 per year. Efficiency was also judged to have increased. In general, therefore, Small presented unit management as having very favorable results with regard to nursing; however, the information about the methods of evaluation used was insufficient to assess the validity of these results.

Lower (1973) described the implementation and evaluation of the unit management program at Borgess Hospital, Kalamazoo; this program was also discussed by May (1974). By pairing each unit manager with an assistant director of nursing, a sharing of responsibility for two or three hospital units each was effected. Increased economy and efficiency were believed to have resulted from this system, in that salary cost savings were realized by reducing the administrative staff from 19 head nurses to 7 assistant directors. Also, utilization of nurses' time was considered to have improved, other hospital departments were considered to operate more efficiently, and patient complaints were virtually eliminated. In general, Lower believed that a more responsive organizational structure was created through unit management.

Gupta, Farrell, and Gugnani (1976) described the program at Cook County Hospital, Chicago, and detailed the problems encountered in the initial unit management program and its eventual reorganization. The success of the program in eliminating positions throughout the hospital at a savings of $400,000 was described, but no information concerning the effect of the program on nurse staffing was provided.

Tamez (1975) presented the results of a small survey of unit management at Villa Rosa Rehabilitation Annex, the psychiatric facility affiliated with Santa Rosa Medical Center. The hypothesis tested was that the introduction of unit management would not bring about a significant change in the perceptions of involved staff of the managerial aspect of the head nurse's role. A total of 113 nursing and unit management personnel participated in the study and answered questions as to who would be the appropriate person--head nurse or unit manager--for solving a hypothetical scheduling problem on the unit. The majority of the respondents stated that the problem was in the domain of the head nurse, although the specific problem chosen was one that the unit manager would have solved. It was concluded that no significant change in the perception of the managerial aspect of the head nurse's role had resulted from the implementation of unit management.

Whalen (1977) presented a case study evaluating unit management at Baptist Memorial Hospital, Kansas City, Missouri, but it neither focused on nursing nor contained information about the effect of unit management on nurse staffing. Munson (1973) presented the results of a broader survey of 14 unit management programs and described six critical stages of each program throughout its implementation. Although this article also did not focus specifically on nursing and did not evaluate the effect of unit management on nurse staffing, it is a valuable basic introduction to the concept of unit management.

In summary, the descriptive-evaluative literature on unit management as it relates to questions of nurse staffing contains only three case studies that provided some evaluation results. These suggested that quality of care, direct care time, patient satisfaction, cost savings, and utilization of nursing personnel could be improved by the introduction of unit management, but the findings must be viewed with reservation because of inadequate research methods.

RESEARCH LITERATURE

In addition to the descriptive and descriptive-evaluative literature on unit management, there is a small number of reports and surveys describing systematic investigations of the effects of unit management on nursing. Schmieding (1966), in one of the early research reports briefly reviewed by Hilgar (1972) and Jelinek et al. (1976), described a study of unit management on one 44-bed ward of a Veterans Administration psychiatric facility in Brockton, Massachusetts. This study hypothesized that as the head nurse was relieved of non-nursing functions by unit management, she would increase the amount of time spent on direct patient care and would also receive guidance from her clinical supervisors in developing direct relationships with her patients.

The study was limited to the two head nurses from the study ward. Their activities were observed by means of work sampling techniques at three separate occasions: before non-nursing duties were delegated to the clerical assistant, and then six and twelve weeks later. The percentage of time the two head nurses spent in direct care, indirect care, communication, non-nursing activities, personnel activities, and planning was determined at each of the three observation points. The data showed that for one nurse, direct care time first increased above and then decreased below the initial level, while non-nursing activities decreased throughout. For the other nurse, direct care time increased throughout while non-nursing activities decreased markedly. Schmieding concluded that relieving head nurses of non-nursing tasks resulted in only a slight change in the amount of direct care given to patients. She stated that it was doubtful whether any marked increase in direct patient care could be obtained by focusing on this organizational level and on only a small number of nurses. The limited number of subjects and the short study period, as well as lack of information on data collection procedures, make these findings even more tentative than suggested by the author.

Condon (1973, 1974) described a large study of unit management. Conducted on two units at Yale-New Haven Hospital, this study sought to determine the effect of unit management on the functions and activities of nursing personnel. Unit management at the study hospital took on five responsibilities previously assigned to the head nurse: service coordination, patient assistance, maintenance of supply and equipment standards, secretarial management, and budgetary management.

Two 70-bed surgical floors with comparable census were selected for study. A unit manager was placed on the experimental floor, while the control floor continued to operate as previously. Measurements were taken on both floors before and five months after the introduction of the unit manager.

Using activity analysis procedures similar to those designed by the Public Health Service (Division of Nursing 1964), 40 trained observers recorded the activities of all staff on the day and evening shifts every fifteen minutes for a five-day period. Both functional categories (e.g., whether centered on patients, personnel, or the unit) and required skill levels (e.g., administrative, nursing, clerical, dietary, housekeeping, messenger, unit manager) were recorded. In addition to work sampling data, attitudes and opinions concerning the functioning of the floors were elicited from 124 staff members, patients, and hospital support personnel by means of self-administered questionnaires. Sampling techniques and response rates for these groups were not specified. Nursing supervisory personnel on the experimental unit also provided written evaluations of the unit management system.

Analysis of the work sampling data revealed that while the two study floors were initially comparable, a slight change occurred on the control floor and a significant change occurred on the experimental floor after implementation of unit management. On the experimental floor, total staff participation in unit-centered activities decreased by 14.8 percent while total staff participation in patient centered activities increased by 15.1 percent. More specifically, the head nurse spent 10 percent more time, the registered nurse 10.3 percent more time, the licensed practical nurse 19.2 percent more time and the aide 23.1 percent more time on patient centered activities. There also were consistent increases for each level of staff in activities requiring their particular skill levels. A total of 87.1 percent of the unit manager's time was spent appropriately, i.e., in unit centered activities. However, the benefits gained from the use of unit management were limited to the day shift, to which the unit manager was regularly assigned, and did not carry over to the evening and night shifts. Responses to the questionnaires from patients, floor staff, and ancillary personnel were generally positive and primarily illustrated the difference in the experimental floor before and after the unit manager was introduced. In general, the questionnaires suggested that unit management resulted in increases in job satisfaction, morale, efficiency, and concern for nonmedical and administrative processes involving patients.

Condon's study is a valuable contribution to the unit management literature and has clear implications for nurse staffing. However, the validity of his finding that nursing time spent in patient centered activities increased as a result of unit management may have been weakened by his use of only a five-day period for activity analysis and by his failure to address interrater reliability and the reliability and validity of study instruments. Furthermore, statistical tests to demonstrate the significance of differences between and within units were not used. Regardless of these deficiencies, this study deserves consideration in any review of factors affecting nurse staffing in hospitals.

Jelinek, Munson, and Smith (1971) examined some of the variables in Condon's study. Their study sought to answer whether Service Unit Management (SUM) in fact realizes the benefits claimed, namely, reducing costs, saving nursing time, improving quality of care, increasing job satisfaction, and setting the stage for further improvements.

A two-part study was carried out over 30 months. A national questionnaire survey was made to identify hospitals with SUM and to identify the characteristics of SUM units, followed by a comparative study of eight selected hospitals of three types: those without SUM, those with SUM on a part of their units, and those with SUM on every unit. A total of 32 nursing units with SUM and 23 nursing units without SUM were included in the study. The selection process for specific units in each hospital was not specified.

Costs for the two types of units were measured in terms of personnel hours and costs per patient day. Staff size and cost were also compared in terms of workload index derived from patient classification. Quality of care for the two types of nursing units was compared by three different measures: (1) a quality index based on sample observations of the absence or presence of certain attributes; (2) expert judgment by professional nurses who observed patient care on the units; and (3) perceptions of the nurses on the study units of the quality of care provided. Efficiency was judged in terms of the level of service rendered, which was based on the quality of patient care.

The extent to which nursing time was saved by SUM was determined by work sampling techniques in which the time nursing personnel spent on various activities was observed and recorded. No specific information was provided about the measurement of nurse satisfaction. Formal data collection was augmented by interviews with personnel throughout the study hospitals.

In general, the investigators felt that SUM was realizing the benefits claimed. No evidence was found that SUM either reduced or increased personnel costs, although the potential to reduce costs related to ancillary departments, supplies, and administration was recognized. The investigators inferred that personnel costs on SUM units were lower as a result of lower turnover costs. It was also concluded that SUM did relieve the nurse, especially the head nurse, of many non-nursing activities. It was clear, however, that nurses had not taken full advantage of the opportunity provided by SUM to return to the bedside. The investigators pointed out that there was nothing inherent in SUM to make nurses change their behavior in caring for patients and added that this would require a separate program to reorient the nurse to bedside care.

Both quality of care and efficiency were found to be higher on SUM units, from which the authors inferred that the units utilized unit personnel more effectively. Job satisfaction was found to be higher on SUM units for both professional and nonprofessional personnel. The authors also concluded that a well established SUM program provided a basis for further positive changes, such as an opportunity to reconceptualize nursing, change ancillary departments, and decentralize administration.

It should be noted that Jelinek, Munson, and Smith did not provide information on data collection procedures, study instruments, and reliability and validity of measurements, nor, for that matter, detailed breakdowns of the study data. Those omissions should be seen in light of their express statement that "This report is weighted to conclusions reached by a multidisciplinary research team rather than to extensive presentations of statistical data for the reader to analyze" (p.11). In fact, the result of their exploratory study of characteristics of SUM programs throughout the country received as much attention in the report as did the results of the comparative study of SUM and other units. Thus, this report accomplished what it set out to do, namely, to describe the characteristics of unit management programs and to draw some conclusions about the extent to which they fulfill their objectives. In this respect, the report provided a great amount of insight into the question of unit management impact on nurse staffing.

Munson and Heda (1976) conducted a related study of the impact of unit management and focused on job satisfaction of nursing personnel. Using the 55 nursing units studied by Jelinek, Munson, and Smith (1971), Munson and Heda set out to determine whether the presence of a service unit management (SUM) program was associated with higher levels of nurse satisfaction, and if so, whether the presence of specific elements in SUM programs would explain this association. Answers to a questionnaire based on an instrument by Porter (1962) were obtained from 351 head nurses, staff registered nurses, and licensed practical nurses. For each selected aspect, the questionnaire asked how much opportunity for satisfaction actually existed, and how much should ideally exist. Subtracting the "available" satisfaction from the ideal response provided a satisfaction shortfall score. Although reliability and validity of the instrument were not discussed, the authors provided references for the instrument and for the research on which it was based.

The investigators found that the satisfaction of head nurses and other registered nurses was higher on units with than those without SUM and was strongly associated with a reduction in nonprofessional tasks. Licensed practical nurses did not appear to be greatly affected by the presence of SUM. The investigators concluded that their analysis of eight hospitals supported the original belief held by hospital and nursing administrators: SUM can improve nurse satisfaction.

Hardy (1977), in a study in which the presence or absence of unit management was only part of the independent variable, hypothesized that patient perceptions of the quality of general care, of care coordination, and of nursing care would be higher on units with both unit management and clinical nurse specialists. The study did not attempt to examine these two innovations separately or to differentiate their effects. Hardy compared 40 patients on two units having unit management and clinical specialists and 40 patients on control units in a 380-bed university medical center. All patients discharged during the data collection period after a hospital stay of four or more days were included in the sample.

An interview schedule developed and pretested by the investigator was administered to the patient sample by nursing students wearing street clothes. The reliability and validity of the instruments were not mentioned. Patients were asked to rate the quality of the following aspects of their hospital stay: general hospital care, coordination of services, cooperation of personnel, overall nursing care, specific aspects of nursing care such as physical care, information, and continuity, as well as general perceptions of nursing care, such as adequacy of staffing and the nurses' knowledge and skill. Data were analyzed by means of correlation techniques and chi-square tests.

Hardy found that patients on both types of units rated general care, coordination of care, and nursing care highly. Although ratings for 11 out of 15 questions were slightly higher for the experimental units, no statistically significant differences were found between units with and those without unit management and clinical specialists. In the opinion of the investigator, these findings indicated either that improvements in administrative efficiency and delivery of nursing care did not enhance perceptions of quality, or that improvements did not occur. She acknowledged the difficulty in assessing the accuracy of patient perceptions, but concluded that introduction of unit management and clinical nurse specialists may not produce the intended improvements in perceived quality of care. Unfortunately, the combination of unit management and clinical specialists into one independent variable makes it difficult to relate this study to the rest of the literature on unit management. This fact, coupled with the methodological weaknesses of the study and the tentative nature of its conclusions, diminishes its value for the assessment of whether unit management affects nurse staffing.

Boissoneau, Robinson, and Wagner (1977) focused on ward clerk perceptions of unit managers' effectiveness as supervisors at a midwestern hospital. However, this study of unit management has little relevance to nurse staffing.

In summary, the research literature on unit management contained six studies. Findings about the effects of the programs are contradictory. While one small study found no increase in direct care under unit management, a larger study did find increases in the amount of direct care as well as improvements in job satisfaction and utilization of nursing personnel. Another large scale study found that nurses were relieved of many non-nursing duties by unit management, but that they did not automatically provide more direct care as a result. This study also found improvements in quality, personnel utilization, and job satisfaction under unit management. Research focusing on job satisfaction under unit management found higher satisfaction by head nurses and registered nurses but no difference for licensed practical nurses. Finally, a study examining the joint effect of unit management and clinical nurse specialists on two control and two experimental units found no statistically significant differences between control and experimental units in patient perceptions of care.

SUMMARY AND IMPLICATIONS: UNIT MANAGEMENT

The recent literature on unit management, particularly the descriptive case studies and the descriptive-evaluative literature, suggests that unit management does "free the nurse to nurse" and results in increases in the quality and amount of direct patient care. Rigorous research to support these claims, however, was rarely conducted. Only the reports by Condon (1973, 1974) and Jelinek, Munson, and Smith (1971) were based on systematic data collection and documented the effect of unit management on the provision of nursing care. It must be noted, however, that even these authors did not address instrument reliability and validity. Condon found marked increases in patient-centered activities by nurses, as well as increases in performance of tasks by the appropriate levels of nursing personnel, as a result of unit management. Similarly, Jelinek, Munson, and Smith found that, in addition to improving quality, efficiency, and job satisfaction, unit management was successful in relieving the nurse of extraneous responsibilities. They pointed out, however, that nurses did not fully exploit the opportunity provided by unit management to provide more direct patient care. This conclusion supports Jokerst's (1975) thesis: unit management may increase efficiency on the unit, but getting nurses to provide more patient care can only be accomplished through the reorganization of nursing services and the development of nursing administration. Similarly, Schmieding (1966) concluded that the amount of direct care probably cannot be influenced by implementing changes, such as unit management, at the unit level. These findings suggest the possibility that the studies may have asked the wrong question. Unit management programs may indeed have highly beneficial effects on indirect care activities and on administrative efficiency which justify their existence, but their potential effect on direct care time provided by nurses other than the head nurse may be minimal.

Taken in conjunction, the findings of Schmieding (1966), Condon (1973, 1974) and Jelinek, Munson, and Smith (1971) regarding the beneficial effect of unit management on amount of direct care provided by nurses, and on the provision of nursing care by appropriate skill levels, have clear implications for nurse staffing. Much of the other literature on unit management also touched on areas of relevance to nurse staffing. None of the authors, however, dealt explicitly with the effect of unit management on the numbers and types of nursing personnel needed on the patient care unit. Questions of organizational mode also have not been addressed. Here, it must be noted that the origins and development of the unit management concept have generally been within the context of team nursing. Thus, the relevance of unit management to other organizational modes, particularly primary nursing, has not been studied (see also Chapter 7). For example, one open question relates to the extent to which the head nurse on a primary nursing unit with a unit management system will be willing to relinquish or to maintain responsibilities. On the other hand, an analysis of nurse staffing patterns in hospitals or an examination of organizational modes of nursing clearly must consider the potential role of unit management.

SCHEDULING

The literature on scheduling of nursing personnel is extensive, reflecting the large amount of administrative time and effort that goes into the process of determining when each nurse will be on or off duty, which shift will be worked by whom, and how to account for weekends, work stretch, requests, and vacations (Warner 1976). Scheduling is intended to match the supply of nursing personnel to the demand for personnel on a given unit over a specific period. Warner proposed the following five factors as important criteria for evaluating scheduling approaches:

> Coverage. How well a system generates schedules which meet minimum coverage requirements while providing even coverage.
>
> Quality. How well the nurses like their work schedules.
>
> Stability. How well the nurses perceive that schedules are being generated on a consistent basis and how well they can predict their time off.
>
> Flexibility. How well the scheduling system can adapt to changes on the nursing unit (rotation of nurses among shifts, personnel changes, requests).
>
> Cost. Resources consumed in making schedules (head nurse time, typing time, computer time).

Two basic approaches to scheduling are considered in the literature: the manual approach and the computer-assisted approach. In manual scheduling, often called the traditional or conventional approach, one or several persons prepare a schedule for a specified time for a group of personnel on one nursing unit, several nursing units, or an entire institution, usually by hand, with paper and pencil. The computer-assisted or computerized scheduling approach uses a computer to keep track of scheduling practices and past working patterns of nurses and to obtain a fast and complete search of possible schedules to determine "good" ones, either by a heuristic search or by using mathematical programming (Warner 1976).

It should be stressed that the scheduling process is only one of the numerous uses of computers in hospitals. Computers are often part of what is known as a hospital information system which includes billing, management reporting, and quality audits. It is generally assumed that the use of a computer for the scheduling of personnel only cannot be cost effective.

Both the manual or computer-assisted approaches to scheduling nursing personnel may use a cyclical pattern, i.e., a technique for assigning work days and time off in a pattern that repeats itself regularly, while taking into consideration the need for proper numbers and mixes of personnel, continuity of care, and work groups (Eusanio 1978). Cyclical scheduling is also referred to in the literature as block or matrix scheduling. In general, the use of cyclical schedules in nursing has evolved from problems related to nurse staffing in hospitals. Prior to the use of cyclical scheduling, the amount of time spent by many professional employees on schedules resulted in high costs, units were chronically over- or understaffed, personnel worked long stretches without a day off, interpersonal relationships were strained as aggressive people got better schedules, and delays in posting schedules caused uncertainty as to work hours.

Two further management considerations relating to the scheduling of nursing personnel are centralization of the scheduling process, and the use of professional versus nonprofessional personnel to devise schedules.

Aydelotte's (1973) review included seven scheduling studies which discussed various aspects of cyclical scheduling, nurse opinions regarding shift rotation, and methods of scheduling. In general, these studies supported the cyclical scheduling method. The Medicus report by Jelinek et al. (1976) included eight references to issues relating to scheduling; these dealt with the application of computers to scheduling, the effect of shift rotation on nursing personnel, and cyclical patterns of scheduling. Jelinek et al. concluded that the use of computers in conjunction with cyclical scheduling has been shown to be efficient, and that resulting improvements have had a definite and positive impact upon morale, job satisfaction, costs, and quality of care.

DESCRIPTIVE-EVALUATIVE LITERATURE

The literature on both manual and computer scheduling was largely descriptive but, since it discussed hours spent or percentages of time saved in various scheduling approaches, in general had an evaluative component as well.

Manual Scheduling

Gahan and Talley (1975) reported favorable staff and administrative responses at Nebraska Psychiatric Institute, Omaha, to manual cyclical scheduling on a decentralized basis and using professional personnel, that is nursing supervisors, to do the scheduling.

With this system, the problem of being overstaffed at the beginning of the week and understaffed at the end of the week and weekend was resolved, and less time was spent in devising schedules.

Aft, Watt, and Thomason (1975) described a matrix scheduling method which they felt differed from the usual manual cyclical schedule by giving two-day and three-day blocks of time off. The authors described the process of developing the matrix schedule in detail and proposed that it be done by either a department head, supervisor, or scheduling clerk. They said that this schedule was helpful in recruiting and holding employees, and required less of the supervisor's time.

Two articles discussed the use of manual cyclical scheduling on a centralized basis for primary nursing units. O'Leary and Hill (1977), at Bayfront Medical Center, St. Petersburg, Florida, believed that this method of scheduling, in conjunction with primary nursing, allowed for more direct care time than their previous noncyclical method. Similarly, Osinski and Morrison (1978) at the Mainland Division of Atlantic City Medical Center reported favorable results with manual cyclical scheduling on a centralized basis for primary nursing units, using a staffing coordinator who was not a nurse. These findings are questionable, however, as changes in personnel mix had also occurred during this time.

Two articles discussed the advantages of cyclical scheduling and gave formulas and examples for a range of cyclical patterns (Howell 1966; Eusanio 1978). Megeath (1978) described his use of Howell's (1966) basic cyclical scheduling plan, which requires only pencil and paper. He found it just as effective as, and perhaps more efficient than, a more elegant mathematical programming format in developing a seven-week schedule for nurses. The new system permitted schedules to be made up much more quickly, and nurses were very satisfied with their new schedules.

Computer Scheduling

One of the earliest uses of computers in hospitals and in scheduling personnel was described by DeMarco and Snavely (1963). They applied data processing techniques to nurse staffing assignments in a 253-bed children's hospital in Akron, Ohio. The computer generated weekly schedules revised daily and per shift; suggestions for assignment changes; and lists of personnel by name at each nurses station. The computations required only ten minutes per shift, and the resulting staffing schedules were also considered to be more patient oriented and more exact.

Computer-assisted nurse scheduling systems as part of an overall staffing process were described by Jelinek, Zinn, and Brya (1973); Miller, Pierce, and Pierskalla (1975); Moriuchi et al. (1978); and Ballantyne (1979). These systems handled nurses' preferences, rotation, weekends and weekdays off, requests, nursing groups and subgroups, arbitrary starting days, as well as other aspects and constraints of scheduling. According to these authors, the benefits of computer-assisted scheduling included personnel satisfaction as reflected in a reduction in turnover, sick calls, and overtime; cost savings; relief of professional personnel of scheduling responsibility; fairer schedules; and more even staffing of the nursing units.

Morrish and O'Connor (1970) described the development of computer-assisted cyclical scheduling for all three personnel shifts at Harper Hospital in Detroit, Michigan. A questionnaire given to nursing personnel indicated that the advantages of the system definitely outweighed its disadvantages. However, based on five years of experience with this program, they recommended to those about to initiate computer-assisted schedules that they begin with simple computer programs, as these could be more easily corrected than sophisticated programs. They also cautioned against unwarranted faith in computer performance. Murray (1971), at Lakeside Hospital, Kansas City, Missouri, reported that computer-assisted scheduling reduced scheduling time from 160 man hours per month for manual scheduling to 30 minutes of computer time plus four nursing hours per month. A modular approach to programming was used so that segments of the program could be removed without the need to reprogram the entire system.

Ross (1975) described a computer assisted manpower allocation system, which was devised and implemented through the data processing and management engineering departments at Mt. Sinai Hospital in New York City to ensure optimal patient care during a strike. This system listed all manpower available for work so that they could be redeployed to patient care and ancillary services as needed. It was found that manpower reports could be produced and distributed much more quickly after introduction of the new system.

In addition to the literature on the manual and computer approaches, one descriptive-evaluative and three descriptive articles on other facets of scheduling were reviewed. Swanberg and Smith (1977) advocated the use of a centralized scheduling department, and Froebe (1974) and Kowalski (1973) advocated different methods of scheduling by teams. The descriptive-evaluative article, by Fisher and Thomas (1974), described a scheduling innovation in which nurses received an extra day off for every extra weekend worked. They found that this "premium day" system equalized staffing throughout the week and provided for better utilization of nursing resources at no increased cost.

In summary, the descriptive-evaluative literature reviewed discussed both the manual and the computer-assisted approach to scheduling. Either of these permit cyclical patterns of scheduling, on a centralized or decentralized basis, and by professional or nonprofessional personnel. Most authors felt that either manual cyclical scheduling, or computer-assisted scheduling with or without a cyclical pattern, were the best approaches to scheduling, and led to time and cost savings, personnel satisfaction, fairer scheduling, and improved staffing. Scheduling by nonprofessional personnel on a centralized basis was favored. Other authors discussed the advantages of a centralized scheduling department, the premium day off, and scheduling by teams. Most of the outcomes or benefits mentioned in the literature appear to be based on informal data collections which did not pay much attention to evaluation methods, however, making it difficult to assess the precise effects of the various approaches.

RESEARCH LITERATURE

Only two research reports dealt strictly with scheduling aspects. Price (1970a) reported on a cyclical scheduling project in five hospitals in Minneapolis and St. Paul, Minnesota, which sought to assist the hospitals in improving staffing and scheduling methods. This study has been reviewed and critiqued in detail in Aydelotte's (1973) review, to which reference is made for a complete description of the study methods. Major aspects of the process and outcomes of the study are reported here, as Price's study is frequently quoted in discussions and articles on scheduling and is considered a major work in this field.

The independent variable in Price's study was the type of scheduling system--conventional or cyclical--in each of the five study hospitals. The dependent variables were personnel hours, absences, costs, time spent on scheduling, personnel changes, continuity of patient care, and patient, nurse, and physician satisfaction. All instruments used to collect data on these variables were devised and reviewed for reliability and validity by the study team, although no details of this instrument review were given. Patient population, unit size, physical design, logistic support, mix of personnel, medical staff, and practices and policies were considered intervening variables.

A basic premise of Price's cyclical module was that the schedule would be known far enough in advance to inform nurses of their days off and enable them to plan appointments, eliminating the need for numerous special requests. While some changes and requests would still occur, it was to be the employee's responsibility to make arrangements to trade hours with another employee and then verify these arrangements with the head nurse. This was to eliminate the need for the scheduler to revise the schedule constantly.

To assist in the scheduling process and to ensure more objectivity, Price developed a staffing board with pegs of different colors which identified categories of personnel, shifts, and days off. In line with predetermined personnel policies, the pegs were placed on the board for each staff member (up to 54 could be accommodated in this scheme) for a four-week period, a repeating pattern she had found most usable.

Favorable reactions were obtained to cyclical scheduling in relation to personnel hours, cost, time spent on scheduling, and staff satisfaction. No difference between conventional and cyclical scheduling was found with regard to personnel absences, continuity of patient care, turnover of personnel, patient satisfaction, or physician satisfaction. In no respect was the cyclical schedule found to be less effective than conventional schedules. The time spent weekly on cyclical scheduling was about one-fifth that spent on conventional methods. While an additional goal of this project had been preliminary work essential for computerization of staffing schedules, at the end of the project the research staff recommended that computerization not be attempted at the time due to the complexity and unreliability of the data involved. They also felt that the simplified methods of staffing schedules developed in the study might obviate the need for computerization.

In a classic study of the implications of shift rotation on the health of nurses and the quality of practice and work performance, Felton and Patterson (1971) recommended that nurses who can adapt to shift changes be placed on undesirable shifts for at least a one-month assignment and be given adequate incentive pay to compensate for more responsibility and the need for professional judgment when supporting personnel were not available. Those nurses incapable of adapting to shift changes should be identified and exempted from shift rotations. In a subsequent, more detailed report, Felton (1975a) elaborated on the effects of shift rotation on nursing personnel. She hypothesized that, in attempting to adapt to the night shift schedule, nurses would experience changes in body temperature and urine cations, creatinine, and osmolality, and in amount and subjective quality of sleep. Measurements were taken every three waking hours over an 18-day period from 39 nurses on rotating shifts. Neither sampling techniques nor study instruments were described, nor was a comparison made between the study nurses and nurses working other schedules.

Felton's hypotheses were supported by the study results. When nurses attempted to adapt to the night shift and subsequently to readapt to the day shift, the timing of peaks in the physiological characteristics under study was found to change. The nurses were also found to get fewer hours and poorer quality of sleep. The investigator felt that on a physiological basis alone, these results demonstrated that the biological clocks of nurses who rotated shifts got out of phase with the environment. Added to this were the possible negative psychological effects of disturbed circadian rhythms. Referring to the extensive literature on biological rhythms and performance, Felton concluded that nurses on rotating shifts live in a situation of conflict between two tendencies in their circadian system. This conflict could lead to errors in practice and judgment.

SUMMARY AND IMPLICATIONS: SCHEDULING

From the literature reviewed, it is apparent that little specific research has been reported on the scheduling of nursing personnel, probably due to the fact that scheduling is so interrelated with the overall process of nurse staffing that the two are generally studied simultaneously. The two basic approaches to scheduling found in this literature review are the manual and the computer-assisted approach. A cyclical pattern of scheduling can be used with either of these approaches, whether on a centralized or decentralized basis, and can be established and maintained by professional or nonprofessional personnel.

The descriptive-evaluative literature indicated that either manual cyclical scheduling or computer-assisted scheduling, with or without a cyclical pattern, offer advantages over a manual, noncyclical approach. Most authors favored scheduling by nonprofessional personnel on a centralized basis. Schedules for four weeks or longer were generally considered preferable. Although several articles mentioned the use of manual, cyclical scheduling on a centralized basis on primary nursing care units, there was no discussion of the effect of the scheduling approach on nursing practice or patient care. Additionally, approaches such as a premium day off for an extra weekend worked and assigning nurses by teams were proposed to assist in the appropriate scheduling and utilization of personnel.

Overall, manual cyclical and computer-assisted cyclical or noncyclical scheduling by nonprofessional personnel on a centralized basis appears to offer many advantages to hospitals and nurses, including a significant savings in professional time spent on personnel scheduling, thereby reducing costs. Predetermined staffing standards can be met and early posting of the schedules allows staff to plan the use of their time off. In some instances, overtime was reported to have decreased, turnover reduced, and recruitment of new personnel was facilitated. The positive results of computer use remain to be verified by means of systematic evaluation.

On the other hand, many factors related to the scheduling of nursing personnel have not been considered in the literature. Of particular concern in the context of this review is the impact of specific scheduling approaches on primary nursing, team nursing, and other organizational modes of care. Although few of the articles reviewed mentioned the organizational mode of nursing practiced, it is probable that most of the hospitals involved were using team nursing. With team nursing, the mix of staff as well as the number scheduled is important. This mix can include registered nurses with baccalaureate degrees, diplomas, and associate degrees, licensed practical nurses, aides, etc. With primary nursing, scheduling may be more difficult and not as amenable to the computer-assisted approach or to cyclical scheduling. Here, constraints on the scheduling process may be imposed by having one nurse assigned to specific patients for the duration of their stay and assuming 24-hour accountability for their care. Manual scheduling by professional personnel on a decentralized unit basis may thus be best with primary nursing, as many individual considerations must be made. Studies on the impact of primary nursing on the scheduling process are clearly needed.

Other areas for further research include the study of which scheduling approaches are most appropriate in hospitals where all staff rotate; where all staff work permanent days, evenings, and nights; or where part of the staff work permanent shifts and part of the staff rotate shifts. Similarly, attention should be paid to the question of which scheduling approach is best for small community hospitals with relatively few nursing personnel, and which is best for large university hospitals with hundreds of nursing personnel. Finally, research into the question of whether any of the existing scheduling approaches affect the quality of patient care needs to be conducted.

THE MODIFIED WORKWEEK

Another management aspect of nurse staffing is the effect of new workweek patterns. Various innovations in hospital workweek schedules have been tried and implemented over the past decade. Those most frequently discussed in the literature are the 4/40; the 7/70; the 12-hour day; and flextime. The 4/40 and 7/70 schedules are both based on ten-hour days. On the 4/40 schedule, nurses work 10 hours four days per week, while on the 7/70 schedule nurses work 10 hours seven days every two weeks. Frequently, the nurses on a 7/70 schedule work seven days straight, followed by seven days off. In the 12-hour day schedule, the nurses either work seven 12-hour days straight, followed by seven days off, or they work six 12-hour shifts and one 8-hour shift every two weeks. They generally are not required to work more than four consecutive days without a day off. Flextime, or flexible working hours, involve a working day divided into two periods, the "core time" or peak period when workers must be present, and the "flextime" before and after, when employees can arrange starting and finishing hours to suit both themselves and the needs of the job. A careful time recording system usually accompanies the implementation of flextime. All of these schedules are alternatives to the traditional five-day, 40-hour workweek schedule in which nurses work one of three 8-hour shifts per day.

In general, these new schedules have evolved from increased employee participation in decisions regarding their working conditions and from problems related to nurse staffing in hospitals. These problems include an inability to staff evening and night shifts adequately, difficulty in giving employees two days off at a time as well as alternate weekends off, staff complaints that the late posting of schedules does not allow them to plan their time, difficulty in having the same number of staff to work each day including weekends, excessive rotations, lack of suitable rest periods between rotations, and growing concern for safety when employees travel to and from work late at night.

Jelinek et al. (1976) concluded from five articles related to this topic that the various workweek configurations have a definite impact on nurse morale, job satisfaction, cost, and quality of care. They felt that the success of innovative schedules was in part due to the strong support of the nursing administration and the participation of the staff in planning and implementing the schedules.

In view of the fact that different approaches to staffing are involved in the four different workweek schedules currently in use, the literature on each is discussed separately.

THE 4/40 WORKWEEK

Descriptive Literature

A number of descriptive articles dealt with selected factors associated with the 4/40 workweek schedule. Interviews with personnel to determine their level of satisfaction with this schedule showed hospital administrative personnel to be very satisfied ("Ten-hour schedule works well in some hospitals" n.a. 1971; "Four-day workweek? Oh, those long weekends" n.a. 1972). Nursing staff also reported that they preferred the 4/40 schedule to the eight-hour five-day workweek (Farrington and Perla 1971; Fraser 1972). Bauer (1971), Daechsel and Jeanotte (1972), and Larsen (1973) discussed the necessity for careful planning and the involvement of the staff in planning prior to initiating new schedules.

Wittman and Johnson (1973) presented an economist's view of the four-day workweek, arguing that it owes its popularity to the economics of manpower costs, and that it could require fewer employees than the eight-hour, 5-day workweek. Fenstermacher (1974) reviewed the history of the 4/40 workweek schedule in industrial and hospital settings.

Schlegel (1973) and Fairbanks (1977), in two articles which dealt primarily with the implementation of primary nursing, included brief discussions of the 4/40 workweek schedule, both claiming that the two-hour overlap of shifts was conducive to improved communication and better patient care.

Descriptive-evaluative Literature

Shaw (1978)at Western Pennsylvania Hospital, Pittsburgh, compared numerous staff-related factors for one 48-bed medical-surgical unit on the 4/40 schedule with another 48-bed medical-surgical unit on the 8-hour, five-day schedule. Although no data were given to support the findings, the following positive benefits were claimed for the 4/40 schedule: absenteeism and overtime were lower on the unit with the 4/40 schedule, and the nursing staff, physicians, administrators, and patients favored it. The work schedules did not appear to have any effect on the number of patient incidents, while the hospital's concurrent nursing audit committee found a marked improvement in the areas of assessment, planning, and delivery of patient care on the unit with the 4/40 schedule. The staff on the 4/40 schedule also showed reduced fatigue and tension and their day-to-day morale improved.

Burrow and Leslie (1972) described three-month trials of the 4/40 workweek in different departments of Creighton Memorial Saint Joseph Hospital, Omaha, Nebraska. Again, few data were given to support their findings, which indicated that on the intensive care and intensive coronary care units, the staff preferred the new schedule, overtime decreased by more than 80 percent, and sick time was reduced. The new schedule was successful in the payroll department, but failed in the maintenance and cashier departments. The authors claimed the schedule worked best where there were regular fluctuations in the work cycle, creating peaks and valleys in the workload of the staff involved. They also stressed the need for employee understanding and input into the proposed schedule changes.

Research Literature

Kent (1972) investigated whether a change from the 8-hour, five-day workweek to the 4/40 workweek would increase the quality of patient care, the quality of the plan of care, and the job satisfaction of nursing personnel working on a pediatric unit at University Hospital, Seattle. The Standards for Nursing Care Checklist (Pardee 1971) was used to measure quality of care, and a checklist was used to evaluate the quality of care plans from written communications. A questionnaire was also developed by the author to measure job satisfaction. Findings revealed little consistent change in observed quality of care or of care plans. Patient and family teaching were the only categories that showed a consistent increase. Job satisfaction appeared improved; sick time and overtime were reduced. These findings must be viewed with some reservation, as the investigator did not address the reliability and validity of the data collection instruments or other methodological issues. Also, the study population was not described and the method of analysis was not reported.

Sellars (1973) examined individual time sheets and personnel records of nurses working on one experimental and two control units to determine if the personnel costs of the 4/40 work schedule were reasonable (not necessarily cheaper) compared with those incurred in the 8-hour, five-day workweek. The dependent variables included regular hours worked, total overtime hours worked, total vacation and holiday hours, and total absenteeism in hours. The study population included registered nurses, licensed practical nurses, and nurses' aides working on three units at Norfolk (Virginia) General Hospital. The experimental unit was a 45-bed general surgical unit and the two control units were one 25-bed surgical unit and one 46-bed medical unit. Analysis of variance and Duncan's Multiple Range Test for means showed that the 4/40 work schedule did not result in increased nursing personnel costs, and may actually have decreased costs.

In summary, both descriptive and research literature on the 4/40 workweek schedule would indicate that administrative personnel and staff prefer it over the 8-hour, five-day schedule. However, it appears that careful planning is needed prior to implementing this schedule and that staff should be involved in planning. One author felt that implementing the 4/40 workweek schedule could decrease the number of personnel needed. Two authors claimed that the two-hour overlap of shifts with the 4/40 schedule on primary nursing units was conducive to improved communication and better quality of patient care. Several authors found less absenteeism, overtime, staff fatigue, and tension with the 4/40 schedule, and observed improvement in the areas of assessment, planning, and delivery of care. A research study found no increase in nursing personnel costs when the 4/40 schedule replaced the 8-hour, five-day schedule. However, more careful attention to measurement and evaluation methods is needed before valid conclusions concerning this schedule can be reached.

THE 7/70 WORKWEEK

Descriptive Literature

A more recent approach to restructuring work schedules, the 7/70 workweek, has so far received only limited attention. Grossman (1978) argued that since hospitals rely on the availability of personnel for their existence and cannot reduce production costs by automation, rearranging work schedules may be a solution to some staffing problems. He included several alternative plans, suggesting that they become items for negotiation. One plan which he described in detail calls for two 10-hour shifts for full-time staff and one 5-hour shift for part-time staff daily, with staff working seven days in each two-week period for the same pay as under the old pattern.

Cleveland and Hutchins (1974), Hutchins and Cleveland (1978), and Rabideau and Skarbek (1978)described the 7/70 workweek schedule as implemented at Evergreen General Hospital, a 76-bed facility in Kirkland, Washington. Two teams worked alternate weeks, Monday through Sunday, ten hours per day and received the intervening week off. The schedules were from 6:45 a.m. - 5:15 p.m.; 12:45 p.m. - 11:15 p.m.; and 9:15 p.m. - 7:45 a.m. Nurses were paid for eighty hours and received no shift differential and no extra pay for holidays worked. On-call staff were utilized when workload necessitated it. The authors, who presented no data to substantiate their findings, claimed the following benefits for the new schedule: improved continuity of care; a better understanding of patient needs because of longer follow-through of patients; greater nurse satisfaction due to the prolonged rest period and advance knowledge of time off for an entire year; improved communication among the shifts due to personnel overlap; greater consistency in levels of nursing care on weekends and weekdays; improved communication between nurses, physicians, and patients; more consistent patient teaching; and more flexibility in planning daily nursing activities to meet patient needs rather than hospital regimens. Furthermore, money and time were said to have been saved in scheduling, absences due to illness were decreased, and resignations were few. There was a waiting list of applicants, and staff morale was high.

Donovan (1978b) discussed problems in numerous hospitals where the 4/40 schedule was tried, and described briefly the 7/70 schedules in use in three hospitals in Oregon and Washington. She believed that the 7/70 schedule worked best in newer, smaller hospitals where work patterns are not too deeply entrenched, and where coordination of team efforts and development of team unity may be more easily attainable. Donovan also pointed out that many of the experiments with new workweek configurations have been discontinued because continuity of care and reporting suffered; they provided inadequate overlap of teams from day to day; nurses were fatigued; problems were encountered in recruiting permanent evening personnel and in handling union questions; adequate staffing could not be maintained during peak hours; and the new schedules were eventually found to require more rather than less staff.

Descriptive-evaluative Literature

Boyarski (1976) described a pilot project with a 7/70 schedule and its full implementation at Mercy Medical Center, Dubuque, Iowa. Two teams alternated working Tuesday, Wednesday, and Saturday of one week and Sunday, Monday, Thursday, and Friday of the next week. All employees were paid for holidays, eliminating the need to replace personnel, and hourly rates were increased by 14.23 percent to eliminate the loss in gross pay. After two years there was a 26 percent reduction in employee turnover, a decrease in overtime, and an increase in employee morale. The author also said that there was an 11.3 percent reduction in nursing care hours, but the import of this finding was not discussed. The advantages for the employees were a three-day weekend every other week, no split days off, knowledge of work schedules three months in advance, a reduction in the workweek without reduction in pay, and pay for holidays.

Colt and Corley (1974) examined the hypothesis that a majority of nursing staff prefer the 10-hour (seven 10-hour days per pay period) shift to the 8-hour shift, on the ground that the 10-hour shift does not adversely affect the quality of patient care nor the quality of the staff members' personal life. Survey interviews held with 301 nursing personnel (roughly two-thirds of the nursing staff) revealed that the majority of those interviewed preferred the 10-hour to the 8-hour shift. Those interviewed believed that there was no difference in the quality of care given on the 10-hour shift compared to the 8-hour shift. The major appeal of the 10-hour day appeared to be the social opportunities afforded by a three-day weekend. Age appeared to be the most significant factor in determining nurse attitudes toward the 10-hour shift, with those under 25 years of age favoring it most.

In summary, the literature on the 7/70 workweek schedule was quite limited, and, in fact, no research literature on this subject was found. The descriptive and descriptive-evaluative literature seemed to indicate, however, that this schedule worked well in a few selected hospitals, where it reduced turnover, overtime, absences due to illness, and increased staff morale. The nurses preferred the 10-hour shift to the 8-hour shift, and younger nurses favored the 10-hour shift most.

THE 12-HOUR DAY

Descriptive-evaluative Literature

No purely descriptive literature on the 12-hour day was found. On the other hand, a range of descriptive-evaluative articles dealt with selected aspects of the 12-hour day, although none provided data to substantiate the findings, nor were study methods presented in sufficient detail to permit critical analysis.

Underwood (1975) described a three-month pilot project concerning the 12-hour day on a four-bed pediatric intensive care unit at Wyler Children's Hospital in Chicago. The staff worked 7:00 a.m. - 7:30 p.m. or 7:00 p.m. - 7:30 a.m. shifts three days of one week and four days of the following week. The staff liked the advantages of this schedule, i.e., less commuting and safer traveling times, overtime on every paycheck, and closer rapport with patients, families, and physicians. The night nurses appreciated seeing the patients when awake and meeting their families and physicians. The 12-hour schedule aided in recruitment, especially of night staff, improved morale, and decreased sick time. It was adopted as the permanent schedule. A different outcome of a two-month trial of the 12-hour shift was reported at Children's Medical Center, Dallas, Texas ("The good and bad of 12-hour shifts", n.a. 1975). Although there was less absenteeism, and the nurses had more time with patients, parents, and physicians, only one of the 17 staff nurses elected to remain on the 12-hour shift after the trial period ended. The other 16 nurses reported that it was too exhausting. Also, more minor accidents and more medication mix-ups occurred on the 12-hour shift.

On the other hand, Cales (1976)reported on 22 registered nurses, licensed practical nurses, and nurses' aides in the regular and premature nurseries at Baptist's Hospital in Pensacola, Florida, who changed from an 8-hour day to a 12-hour day. They worked 7:00 a.m. - 7:00 p.m. or 7:00 p.m. - 7:00 a.m. shifts for seven straight days and then had seven days off. They found that they did not need part-time help, that much less time was spent on scheduling, and that only ten people were required during each 24-hour period instead of the twelve needed for 8-hour shifts.

Fortin (1973) described the implementation of six 12-hour shifts and one eight-hour shift every two weeks on an eight-bed intensive care unit. The patients liked the system since they got to know the evening nurse who would be there through the night. Sick time was reported to have decreased from 18 days during the previous six months to 6 days during the six-month trial period. Ganong, Ganong, and Harrison (1976) reported on findings from a study conducted by Harrison at the Medical Park Hospital in Winston-Salem, North Carolina, from 1971-1973. The nursing staff in this 132-bed hospital worked from 7:00 a.m. - 7:00 p.m. or 7:00 p.m. - 7:00 a.m., Thursday through Wednesday, and were off the following seven days. A cost-benefit analysis of the 12-hour shift indicated better utilization of nursing personnel, resulting in lower staffing requirements in three categories of nursing personnel and in savings in payroll expenses in excess of $41,000 annually. Nursing manpower hours for peak workload periods were not significantly affected, however, and the savings occurred during those periods of the day when workload requirements did not justify increased staffing. The nurses enjoyed the greater blocks of time off and thought the 12-hour shifts provided the opportunity for greater communication and improved continuity of care between physicians and nurses. They also reported improved morale and better patient relations. Registered nurses, licensed practical nurses, nurses' aides, patients, physicians, dentists, and management and supporting services personnel all favored the 12-hour shift. Deans and McSwain (1972) also described the 12-hour shift at this hospital, and found that in one year, absenteeism had been reduced by 50 percent and a payroll savings of $39,600 realized.

DeMarsh and McLellan (1971, 1972) reported a six-month and an eighteen-month appraisal of the 12-hour shift on a 36-bed medical ward at Winnipeg General Hospital in Winnipeg, Canada. The nursing personnel worked six 12-hour shifts and one 8-hour shift every two weeks. Compared to another 36-bed ward with the same number of staff, only 5 shifts of relief nurses were needed on the experimental unit during six months, while 77 shifts of relief nurses were needed on the control unit. The night nurses preferred traveling to the hospital at 7:30 p.m. rather than at midnight and appreciated seeing the patients while they were awake. Also, two shifts of nurses were less confusing to the patients than three shifts. The authors claimed that after 18 months of 12-hour shifts, there was a slight reduction in medication errors and incidence reports, and staff morale was high.

The descriptive evaluative literature, therefore, seemed to favor the 12-hour day.

Research Literature

Two research reports on the 12-hour day reported in detail in the literature were less conclusive. Hibberd (1972, 1973) conducted a study to investigate the feasibility of a compressed workweek for nursing staff. The nurses worked six 12-hour shifts and one 8-hour shift in a two-week period. The investigator compared patient satisfaction, selected aspects of nursing care, job satisfaction of the nursing staff, and selected fixed and variable costs of staffing on one 8-hour shift control unit and on two experimental units. Fifty-eight nursing personnel were selected. The investigator pointed out that selection was not random, and that the nurses were biased in favor of 12-hour shifts at the start of the study.

Patient satisfaction was measured by means of a 50-item questionnaire which was claimed to have content validity. The aspects of nursing care investigated were the patient's immediate condition, environment, Kardex plan, and nursing records. A nursing care observation sheet consisting of 35 items was constructed and submitted to a committee of expert nurses; this committee considered all items to have content validity. Two nurse observers used the observation sheet to make simultaneous, independent observations of nursing care during four observation periods occurring at five week intervals; the composite correlation coefficient for these ratings was .80 (i.e., fairly consistent). The overall job satisfaction of nursing staff was also measured. A questionnaire with 25 items, as well as a parallel form, was constructed (50 items in all). All responses to these items were analyzed for internal consistency, and twenty-four of the paired items were found to be reliable; factor analyses demonstrated construct validity for twelve of these pairs. The following aspects were investigated in relation to fixed and variable costs of staffing: resignation; commencements; transfers of staff to and from the research units; sickness hours; absent hours; and relief staff hours.

Using Kruskal-Wallis analysis of variance, no statistically significant differences were observed within any of the three research units in patient satisfaction or selected aspects of nursing care. With regard to overall job satisfaction of nursing staff, all three units obtained the highest scores (greatest satisfaction) at the pretest, and a gradual decline in all scores was observed throughout the study. Nurses reported that 12-hour shifts were too long and too tiring, and that the advantages of more consecutive time off did not compensate for the physical and emotional exhaustion experienced after working four consecutive 12-hour shifts. No significant changes in fixed or variable costs of staffing were observed as a result of this experiment.

Stinson and Hazlett (1975) at the University of Alberta (Edmonton) Hospital, Canada, replicated, with modifications, Hibberd's (1973) study. General duty registered nurses, certified nursing aides, staff physicians, and residents on two pediatric wards were queried in this study to determine the impact of the 12-hour shift on job satisfaction, preference for the 8-hour versus the 12-hour shift, and physician satisfaction with nursing services. The authors also investigated whether nurse job satisfaction and preference for a shift varied in terms of job categories, marital status, or type of pediatric unit on which they worked.

The nurse survey instrument contained 17 pairs of items designed and previously used by Hibberd (1973), who had shown the instrument to have some construct validity. All items on the questionnaire were subjected to parallel-item reliability tests in which a minimum of 75 percent agreement on each pair was required. Two of the pairs of items failed to meet the 75 percent parallel item reliability requirements and were discarded. The physician survey instrument centered upon opinions regarding five basic content areas: nursing staff availability; satisfaction with the standard of nursing care; satisfaction with communication of physician orders; adequacy of the numbers of nursing staff; and estimated job satisfaction of the nursing staff. Parallel-item reliability tests were performed. Only the first three areas cited met the 75 percent response consistency requirement.

The sum of the scores for each set of parallel items was calculated and t-tests were used to determine statistical differences between pre- and posttest scores. The relationship between the proportion of nurses favoring 8- and 12-hour shifts, on the one hand, and personnel categories, marital status, and type of pediatric ward, on the other hand, was assessed using a chi-square test of independence.

The majority of the nursing staff were in favor of the 12-hour shift. Their job satisfaction was not adversely affected by a redistribution of working hours. Preference for the 12-hour shift was not related to job category, marital status, or type of pediatric nursing unit, and the trial did not affect physician opinions of the nursing service.

In a study related to the Stinson and Hazlett study, Ryan (1975a) compared fixed and variable costs of staffing in the same hospital. She compared cost data for 12 weeks prior to the Stinson and Hazlett study with costs during the 15 weeks of the study on the two pediatric wards. There were no significant changes in the selected indices of fixed and variable costs of staffing between the pretrial and trial periods. This 12-hour schedule was adopted as the permanent form of scheduling on these two wards and was implemented on other wards as well.

Overall, the literature on the 12-hour day seemed to indicate that this schedule is more controversial than either the 4/40 or 7/70 schedules. It was accepted well by some nursing staff and rejected by others. Those who favored the 12-hour day claimed that it aided recruitment, improved morale, decreased sicktime and turnover, improved continuity of care, and led to cost savings through better utilization of nursing personnel. Others felt that it was too exhausting and did not fit the average lifestyle.

FLEXTIME

Only two articles were found on the use of flextime scheduling in the hospital setting, both of which were purely descriptive.

McCarrick (1972) reported on a night supervisor's experience with flextime. The supervisor claimed that flexible hours, including parts of days and evenings along with night duty, permitted a better coordination of the activities of the night staff employees with those of other personnel and administrators. Bissett and Graham (1977a,b) developed a questionnaire for the nursing personnel in two small hospitals in Scotland to ascertain staff impressions of the feasibility and desirability of flextime. They found that most of the staff favored the concept and believed that the advantages would be improved recruitment and morale; less absenteeism; increased productivity; and a choice of working hours. Potential disadvantages mentioned included disruption of teamwork; impaired working relationships; increased costs; and more worker fatigue. The authors believed that many problems would have to be surmounted and careful guidelines written prior to implementation.

SUMMARY AND IMPLICATIONS: THE MODIFIED WORKWEEK

The literature reviewed suggests that innovative workweek schedules such as the 4/40, 7/70, and the 12-hour day have many advantages and some disadvantages for nurses and hospitals. There are no detailed reports on the use of flextime in hospital settings.

4/40 Workweek. From the descriptive and descriptive-evaluative literature on the 4/40 workweek, it appears that this schedule is superior in several aspects to the 8-hour, five-day workweek. Administrative personnel and staff and patients preferred the 4/40 schedule; implementing it decreased the number of personnel needed in some instances; absenteeism, overtime, staff fatigue, and tension were reported to decrease; there was improvement in the areas of assessment, planning, and the delivery of care; and staff morale increased. In the only study of the 4/40 workweek that provided sufficient data for a critique, Sellars (1973) found no increase in nursing personnel costs when the 4/40 schedule replaced the 8-hour, five-day workweek schedule.

7/70 Workweek. The literature on the 7/70 workweek schedule was descriptive-evaluative only and was limited to a few hospitals, where it led to reductions in turnover, overtime, and sicktime, and to increased staff morale. For example, Colt and Corley (1974) found that the majority of nurses interviewed preferred seven 10-hour days per pay period to 8-hour shifts and believed that there was no difference in the quality of care given on the 10-hour shift as compared to the 8-hour shift. The major appeal of the

10-hour day appeared to be the social opportunities afforded by three-day weekends. Age appeared to be the most significant factor in determining the nurses' positive attitudes toward the 10-hour day, particularly for those under 25 years of age.

12-hour Day. Of seven descriptive-evaluative articles on the 12-hour day, six reported favorable and one reported unfavorable responses to this schedule. Advantages were less commuting; safer traveling time; overtime on every paycheck; closer rapport with patients, families, and physicians; and the opportunity for the night nurse to see patients while they were awake and to meet their families and physicians. Sicktime and turnover were said to decrease, as did medication errors and incidents. Staff morale increased and less time was needed for scheduling. Also, fewer people were needed than on the 8-hour shift, leading to cost savings through better utilization of personnel. The author of the only descriptive-evaluative article which reported unfavorable responses to the 12-hour day, said that nurses found it too exhausting and more accidents and medication mix-ups occurred than on the 8-hour shift.

Two major studies on the 12-hour day were reported by Hibberd (1972, 1973) and Stinson and Hazlett (1975). While Hibberd reported that the nurses in her study found the 12-hour day physically and emotionally too exhausting, Stinson and Hazlett, who replicated Hibberd's study in modified form, reported that the nurses in their study favored the 12-hour day. The differences in the results of these two studies could be due to one or more of the following variations in the two study populations and research methods. In Hibberd's study, 70 percent of the nurses were married and all worked on an adult medical-surgical unit. Data were gathered before, during, and after the introduction of the modified workweek, and a programmer did the scheduling, with little provision for staff to express their preferences. In Stinson and Hazlett's study, on the other hand, only 33 percent of the nurses were married and they worked on a pediatric unit; data were gathered only before and after implementation of the new workweek, and a head nurse who took specific staff requests into consideration did the scheduling. Age was not considered a variable in either study.

In general, the majority of the authors stressed the importance of careful planning prior to implementing a new schedule, the need to include all affected staff in the planning process, and to keep lines of communication open after implementation. They also stressed the need for each institution to devise its own schedule and not simply to try to implement one which has been successful elsewhere.

Many aspects of the modified workweek have not been considered in the literature. Of particular concern here is the impact of workweek schedules on team nursing, primary nursing, and other organizational modes. Only two articles mentioned the organizational mode of nursing practiced. Schlegel (1973) and Fairbanks (1977), both discussing the 4/40 workweek, claimed that the two hour overlap of shifts on primary nursing units was conducive to improved communication and better patient care. It is probable that most other hospitals described were practicing team nursing. Therefore, most of the results reported may be assumed to be associated with team nursing, and there is little indication of how these modified workweek schedules affect primary nursing. It is possible that a primary nurse working seven days straight either on a 10-hour or 12 hour daily schedule, with the associate primary nurse working the alternate week, may be able to provide better continuity of care than on an 8-hour five-day schedule with scattered days off. Much more research needs to be undertaken, however, to determine the compatibility of specific schedules with the various organizational modes of nursing.

Another open question is whether the benefits of these modified workweek schedules can withstand the test of time. Donovan (1978b) reported that many of the experiments with new workweek configurations have been discontinued because continuity of care and reporting suffered; they provided inadequate overlap of teams from day to day; nurses were fatigued; problems were encountered with regard to recruiting permanent evening personnel and union questions; adequate staffing could not be maintained during peak hours; and the new schedules were eventually found to require more rather than less staff. Thus, it may well be that modified workweek schedules were started to satisfy nursing staff demands, and that many of the other outcomes which have been studied were only ancillary considerations.

Finally, although many outcomes have been mentioned in the literature as results of initiating modified workweek schedules, none has been studied sufficiently. Therefore, the effect of modified workweek schedules on the numbers of personnel needed, absenteeism, overtime, turnover, staff fatigue, tension, quality of care, and continuity of care remain to be studied in depth. The question of how temporary nursing personnel from outside agencies can fit into these schedules also needs to be studied. In general, the literature to date has focused on the impact of workweek innovations on staff satisfaction. Further, careful research examining the relationship of the modified workweek to organizational modes, scheduling, amount of direct care provided to patients, staffing patterns, and staffing methodologies needs to be conducted.

Chapter 7

OPERATIONAL FACTORS: ORGANIZATIONAL MODES OF NURSING

One of the most important aspects of nurse staffing is the organizational mode of nursing. The term, organizational mode, encompasses both a specific philosophy of nursing and the actual organization of nursing care on the nursing unit, and is sometimes used interchangeably with the term, assignment pattern. Most basically, the organizational mode reflects the way in which responsibility for patient care is assigned to nursing personnel. Although there have been many different ways of organizing nursing care in the past century, they generally have fallen into one of four modes. Each of these has represented not only an internal arrangement of nursing in the health care setting, but also a response to forces in the larger environment.

The first mode recognized historically is the case method, which started in private duty nursing when care was often given in the home. In this mode, one nurse was responsible, for as long as she was on duty, for providing all the nursing care to one patient. Such a one-to-one assignment is still seen in some health care settings today. The second mode distinguished in the literature is the functional mode, introduced in the 1920s. In functional nursing care, responsibilities were allocated according to task, so that each nurse was responsible for one task (e.g., baths, medications, treatments) for a large number of patients. Functional nursing was the chief organizational mode in use in hospitals until the mid-forties, when team nursing was introduced as a response to a shortage of registered nurses. At the same time, there were many nonprofessional nursing personnel who had entered the field during the the Second World War. Thus, a natural solution to this shortage was to place nonprofessional nursing personnel under the supervision of a registered nurse, the team leader, to provide care to a group of patients. The team leader became responsible for planning care for all patients under the team, delegating some care to team members while performing highly skilled tasks herself and training and supervising team members.

The fourth mode, primary nursing, was first implemented in the late 1960s as a response to dissatisfaction with the fragmentation of responsibility and care under team nursing. The growth of the primary nursing mode, which emphasizes the autonomy and accountability of the nurse and demands that one nurse take full responsibility for the care of a small group of patients throughout their stay on the unit, has been linked to the drive for professionalization of nursing.

In addition, there now are other modes, in particular the unit assignment system at University Hospital, Saskatoon, Saskatchewan, and the total patient care system at the Loeb Center for Nursing and Rehabilitation, Bronx, New York, both of which also originated in the 1960s. These two organizational modes, as well as other organizational innovations described in this review, may in fact be variations of the four basic modes. In general, the discussion of organizational modes is complicated by the fact that no single mode is practiced uniformly across settings, but instead must respond to needs and constraints in each specific nursing unit environment.

Chapter 7 is divided into two sections. The first reviews the literature on the organizational modes of team nursing, the unit assignment system, the Loeb Center system of total patient care, and innovative modes which are derived from them. The second reviews the extensive work on primary nursing, which has dominated the literature related to nurse staffing in the past decade and has influenced staffing decisions throughout the country.

TEAM NURSING, THE LOEB CENTER SYSTEM, AND UNIT ASSIGNMENT

There are a number of articles and reports on modes other than primary nursing which deserve attention in a review of factors affecting nurse staffing. Of particular interest is the literature on team nursing, including four studies comparing it to other modes, the Loeb Center system of total patient care, the unit assignment system, and modifications of these modes. The focus is on literature published since 1970, although earlier literature on the Loeb Center is included.

Previous surveys have examined some of the early literature on these modes. Aydelotte (1973) referred to one article on the Loeb Center system and to one report on unit assignment; Georgopoulos (1975) reviewed four works on team nursing and some modifications of this mode; Jelinek et al. (1976) reviewed works on team nursing from the late 1960s and early 1970s, stating that few attempts at systematic evaluation had been made. Conclusions about the effectiveness of the different modes were made in neither of these reviews.

DESCRIPTIVE LITERATURE

Team Nursing

The more recent descriptive literature contains little on the team nursing mode. Several articles on the subject from the early 1970s are reviewed here; they may be considered representative of the body of thought on team nursing as it had evolved to that time.

Germaine (1971a) discussed the philosophy and definition of team nursing and the factors which affect its operation. She defined team nursing as "a group of nurses working together cooperatively toward a common goal, that of providing patient-centered care" (p. 46). Considering team nursing as a philosophy rather than a method of nursing, she stated its purpose to be the replacement of fragmented patient care by a system under which care would be assigned to personnel skilled to give that care. She included among factors which may affect patient care and the operation of team nursing in a hospital the effectiveness of the nursing director, the organizational structure of the nursing department (centralized or decentralized), the utilization of nursing personnel, the physical design of the hospital, the philosophy of the hospital and its individual departments, the expectations of the medical staff, and the quality of the nursing personnel. Germaine concluded that there are many aspects of the application of team nursing theory which are not completely controlled by the nursing department, and that effective team nursing requires cooperation and support from all involved hospital personnel.

Kron (1971) similarly defined team nursing as "a method of management of patient care based upon the premise that a small group working together, guided by a nurse-leader, can give better patient care than ... if working alone" (p. 19). Kron discussed some of the misconceptions about team nursing which have led nurses to think it no longer practicable. These include the belief that team nursing implies one set of inflexible rules which must be strictly observed. Another misconception is that team nursing can only be practiced with traditional staffing mixes, on certain shifts, or in certain patient care areas. Kron disputed these notions and stressed that there is more than one way to practice team nursing. For her, the principles of team nursing can be applied at all times on all hospital units, although she points out that they may not be used in the same way on every unit and on every shift. She emphasized that leadership by the professional nurse in planning and giving personalized care, and the use of a variety of communication methods to ensure continuity of care, are vital to effective team nursing.

In an article delineating some of the changes which have occurred in nursing over the past century, Manthey (1971) discussed some of the major problems created by the team pattern. One was the fragmentation of care caused by centering on tasks rather than on the patient, and which resulted from the differentiation of services according to skill levels, a concept essential to team nursing. Another problem inherent in the team structure is that of complex channels of communication. A third problem created by team nursing and discussed by Manthey arises from the shared responsibility for patient care. Under the team structure, nursing personnel must share responsibility for the patients assigned to the team, but, in Manthey's opinion, no effort is made to control the number of patients for whom each nurse is responsible. A final problem arising from the team mode of organization centers on the assignment of tasks according to skill level. She criticized nursing for assigning tasks rather than patient care and for using a mass production model rather than a model of professional nursing practice in carrying out team nursing across the country.

An article by Froebe (1974) on team nursing, which treated the nursing team as a scheduling unit rather than an organizational entity, advocated the assignment of nurses to patients by teams rather than individually. She compared team assignment in nursing to team assignment in air traffic control and cited the social support in decision making and stability of the work group as advantages of scheduling by teams.

The Loeb Center System of Total Patient Care

Several articles described the organizational mode of nursing still practiced at the Loeb Center for Nursing and Rehabilitation, Montefiore Hospital, Bronx, New York. As illustrated by Hall (1963), the 80-bed center for recuperating hospital patients offers an organization and program of professional nursing in an institutional setting which constitutes care halfway between home and hospital. Professional nurses, supported only by messenger-attendants and ward secretaries, provide nursing care. In a later article, Hall (1969) provided some details about the organization of nursing care at Loeb. The same number of nurses is assigned to the day and evening shifts. There are no head nurses or supervisors at the Center, but a senior staff nurse is available on each floor during each shift to act as a role model and as a consultant on nursing problems for the staff.

Alfano (1969) described the method of assignment employed at the Loeb Center, in which each nurse rotates every six weeks to a block of rooms which represent her district. For that time, all patients admitted to that district automatically become her responsibility. Bowar-Ferres (1975) also discussed the Loeb philosophy. Elaborating on the nursing organization at Loeb, she explained that each nurse carries a caseload of eight patients. The day nurse discusses with the evening nurse the patient's progress and decisions about care, and each nurse is considered to be responsible and accountable for her own practice. Englert (1971) described the practice at Loeb in similar terms, while Anderson (1971) focused on the rehabilitative aspects of nursing care at Loeb. Ciske (1979), in an article on accountability in primary nursing, characterized the organizational mode at Loeb as total patient care. She distinguished the Loeb mode, in which nurses are assigned responsibility for their patients for an eight-hour period, from primary nursing care, in which the primary nurse is given 24-hour responsibility, from admission through discharge, for a small group of patients.

Carlson, Kaufman, and Schwaid (1969) described the organizational mode of nursing implemented at Long Island Jewish Medical Center, New York, where the philosophy of nursing care at the Loeb Center was adopted in an effort to put into practice the ideals of professional nursing. The result was claimed to be a flexible, democratic, patient-centered organization in which each professional nurse was made responsible, whenever possible, for the total care of her patients throughout their entire stay.

Unit Assignment System

The unit assignment system, which was conceived at University Hospital, Saskatoon, Saskatchewan, is described by Sjoberg, Heieren, and Jackson (1971). Activity studies conducted at the hospital had revealed that many of the nurses' activities reflected the organization of the wards and the method of patient assignment rather than the needs of the patients. On the basis of these findings, experiments were conducted with the unit assignment system which, although recognized as an organizational mode, is also based on an innovative physical design of the nursing unit (see also Chapter 8).

Unit assignment at University Hospital is defined as a method of ward organization in which the ward structure is decentralized and divided into units of care which are identified as intense, above average, average, and minimal care units corresponding to the patient classification system. A unit on the ward is defined as the number of patients who can be cared for by one registered nurse with adequate professional or nonprofessional nursing assistance. A portable supply and communication station is centered on each unit, thereby eliminating the need for a central nursing station. Similar categories of patients are grouped together on a unit in order to predict the work load and equalize it among the staff members. When a patient's category changes, he may be moved to the appropriate unit on the ward or unit boundaries may be changed; each of the units can be expanded or contracted depending on patient needs and numbers. Advantages of the unit assignment system were said to include improved continuity of care, increased opportunities for nurses to give direct care, simplified management, flexibility in staffing, and increased job satisfaction.

Other Modes

There are several descriptive articles presenting innovative nursing modes which appear to be modifications or combinations of primary nursing, team nursing, the Loeb Center system of total patient care, and the unit assignment system. Martin, King, and Suchinski (1970) described the nurse therapist program at the Rehabilitation Institute of Chicago, which appears to be a synthesis of team and primary nursing. In this program, all registered nurses function as nurse therapists. Upon admission, patients are assigned to a nurse therapist who becomes their "anchor person" throughout the rehabilitation. Each nurse therapist is directly responsible for the care of a small group of patients. The nurse therapists work within a team nursing structure and also function as team leaders or team members. The nurse therapist program is believed to contribute to better defined patient care and better unit organization. The authors claimed that through this program, nurses learned to share responsibility while accepting individual accountability.

Van Meter (1977) presented an innovative organizational structure practiced on a neurology-neurosurgery unit at University Hospital, Ann Arbor, Michigan, which appears to be based on both the primary nursing and unit assignment systems. This unit is divided into five progressive patient care zones on the basis of unit design and patient status. This division was made to provide nurse-patient ratios which would encourage a high level of nursing care. The zones with the sickest patients have the highest nurse-patient ratio and each nurse eventually rotates through all five zones. Within this organizational structure, a degree of primary nursing is practiced, in that nurses select patients for whom they wish to function as primary nurses, although not all patients have a primary nurse. However, when a primary patient is transferred among zones, the original primary nurse ceases to be responsible for him. Primary nurses are said to have 24-hour responsibility for their primary patients.

Another combination of the team and primary nursing modes was described by Mattox (1979). Primary-team nursing at Dialysis Clinic, Atlanta, is claimed to incorporate many of the goals of primary nursing within an organizational structure similar to that of team nursing. Five nursing teams made up of primary and associate nurses each caring for four to six patients are assigned to five teams or shifts of patients. Mattox felt that this new mode allowed patient care to become less routine and technical and nursing practice to become more professional. Rennicke (1979) discussed the "eclectic model" at St. Joseph's Hospital, Tucson, Arizona, in which functional, team, modified team ("mini-team"), case method, and clinical specialist nursing modes are used in those areas of the hospital where they are considered appropriate.

Also, there were several general articles presenting philosophical and historical comparisons of nursing modes. Mackay and Ault (1977) described a plan for moving nursing care from a task oriented, functional approach in which the chief concern is getting the work done, to individualized nursing care in which the chief concern is meeting each specific patient's physical, psychological, and social needs. The authors identified three current approaches to providing individual nursing care: team nursing, primary care nursing, and primary nursing. A framework for making the transition to individualized nursing care, applicable to all three approaches, was presented.

Two articles from England discussed organizational modes in philosophical terms. Marks-Maran (1978) compared task allocation (functional nursing), team nursing, and patient allocation, where one nurse is responsible for a small group of patients, either for the duration of a shift, a week, or the hospital stay. She considered patient allocation to be the best type of ward organization, as it enables nurses to plan care around individual patient needs. Patient allocation also was said to permit nurses to redefine their roles, decrease fragmentation of care, improve communication, and result in a more integrated system of care in which each nursing action is taken on clearly understood grounds. In a related article, Plumpton (1978) elaborated on the advantages of an allocation of nurses to patients rather than to tasks, and discussed her experiences as a student on a variety of wards operating with different methods of patient assignment and ward organization.

Beswetherick (1979) gave a brief historical overview of staffing modalities, tracing changes which have occurred in patient assignment systems and unit organization in this century, and discussed in general terms several of these modalities. Specifically mentioned were group assignment (practiced from 1940-1950), a task oriented system in which a single nurse provided all care to a small group of patients, and patient assignment (practiced from 1945-1955), in which patients were selected and assigned to nurses according to severity of illness and symptoms. According to Beswetherick, the chief modalities currently in use are progressive patient care, the Friesen concept, team nursing, primary nursing, and unit assignment. Beswetherick concluded by stating that commitment to any one nursing modality should remain tentative, as nursing should above all maintain flexible attitudes toward developing and improving new ways of organizing and delivering care.

In summary, the descriptive literature on team nursing, the Loeb Center system of total patient care, and the unit assignment system is mainly concerned with presenting the definitions and philosophies of each mode. Four case studies on modes which appeared to be modifications of the team, unit assignment, and total patient care modes described the advantages and potential benefits of the respective approaches. Two articles on team nursing discussed misconceptions about team nursing and potential problems in its operation, and several historical and philosophical discussions reviewed the development of organizational modes in a general framework.

DESCRIPTIVE-EVALUATIVE LITERATURE

The recent nursing literature contains a number of articles which, although largely descriptive, nevertheless presented findings from evaluations of different organizational modes. Kramer (1971), in an article which discussed basic team nursing concepts, also presented results of interviews conducted with nursing administrators and staff nurses about their views of team nursing. In general, Kramer found that team nursing was different things to different people. Most nursing directors considered team nursing more a method of work organization than a philosophy, and staff nurses had more negative than positive opinions about the team mode. On the basis of her interviews, Kramer concluded that the greatest failure of team nursing was goal displacement, in that in many hospitals this mode had become a routine in which the original end had been supplanted by concentration on the means.

Other descriptive-evaluative articles on organizational modes were primarily case studies, with some informal evaluation results, of an innovative mode in a single hospital. Most of these variations appear to incorporate at least one element of primary nursing, as well as elements of team nursing and unit assignment, and were considered successful by their evaluators. All appear to have involved a change in physical design of the unit.

Beath (1971) described a model unit at Victoria General Hospital, Winnipeg, Canada, which eliminated the central nurses' station. In addition to the introduction of nurse servers for charting and storage of medications and supplies for each patient room, a new organizational mode, described as clinically oriented care, was introduced which involved team nursing by an all-RN staff. Although a team was responsible only for an 8-hour shift, an effort was made to relate that segment of care to the entire 24-hour nursing day. Both patients and nurses reacted positively to the new system. A formal evaluation including activity studies, quality measurements, statistical analysis of length of stay, patient incidents, and turnover, was under way when the article was written.

A similar innovative mode on a 39-bed medical-surgical unit at St. Mary's Hospital, Milwaukee, was described by Porter (1973). On this unit, the central nursing station was eliminated and replaced by supply cabinets attached to the patients' rooms. Each registered nurse was assigned total responsibility for a small group of patients. As a result of these changes, nursing personnel were able to spend 75 to 80 percent of their time with patients, twice as much as nurses on a control unit. Patient satisfaction and quality of care were also evaluated and found to be high under the new system.

Harris (1974) described a model medical unit at Baptist Medical Center, Little Rock. Staffed entirely by baccalaureate nurses, the unit was decentralized by the use of portable desks for charts, medications, and supplies. Although the unit functioned within a team structure, each nurse was responsible for a small group of patients and was expected to meet all or most of each patient's needs. The system increased nurse and patient satisfaction, decreased nurse travel time, absenteeism, and turnover, and led to better adjustment by new nursing personnel. Disadvantages were observed but were considered to be greatly outweighed by the advantages of the system.

Race (1974) defined and discussed the advantages of total patient care, an experimental, nurse-centered mode at several hospitals including Holy Family Hospital in Spokane, Washington, which freed registered nurses from many unessential duties and held them responsible for the nursing care of approximately four or five patients on the day shift. Nurse servers were located between patient rooms. Patients with similar conditions were grouped together in the same or adjoining rooms so that nurses with particular interests and skills could serve them most effectively. The new mode was believed to enable nurses to spend more time with their patients. A survey using an anonymous questionnaire revealed that 99 percent of the nurses on the experimental unit approved of the new mode.

In an article discussing theories of organization and leadership and the nursing service of Blake Memorial Hospital, a small community hospital in Bradenton, Florida, Miller (1976) described a nursing unit organized under a "buddy system." Patients on the unit were grouped into maximum, moderate, and minimum illness categories. The unit was divided into four 10-bed areas. One registered nurse and one nursing assistant, the "buddies," were assigned permanently to a geographical area of the unit, assisted by a generally available licensed practical nurse when necessary. This system, which is considered to be a form of team nursing and provides for "built-in" supervision, was well received by the staff. Care was considered improved as a result of a decrease in medication errors, and there was a decrease in the use of call lights by the patients.

An innovative mode based on the creation of a new nursing role on the patient unit was described by Clark (1977). In this mode, a nurse clinician is responsible for about 20 patients, is regarded as both planner and counselor, and is not restricted to a specific shift. In addition, a unit may be staffed with one registered nurse or licensed practical nurse for every seven patients. As part of this new staffing pattern, a nurse cares for the same group of patients throughout their stay wherever feasible. A patient satisfaction survey revealed that patients on a unit with the innovative nursing mode referred to nurses by name more often than did patients on the control unit. The author also claimed that implementation of this system had resulted in reduced patient disability and in cost savings.

Hohman (1979) reported on the nurse mentor system at Children's Hospital, San Francisco. Under this system, a nurse mentor functions as a role model and leader for a nursing unit. Aided by two or three assistants, he or she is responsible and accountable for the total care of a specific group of patients for an 8-hour shift. Members of the nurse mentor team are assigned to work together regularly and are assigned the same patients as frequently as possible. The system is said to assure that there will always be a nurse on the unit who is familiar with the patient and his care. The introduction of the nurse mentor system decreased employee tardiness, absenteeism, and turnover, and favorable opinions were received from the medical staff. The system was judged to result in a higher quality of care at no additional cost.

Graham, Coher, and Jenkins (1976) proposed the team and practitioner approaches to total patient care and presented the results of a survey of attitudes of health professionals toward concepts associated with the "involvement attitudes" of the team approach to total patient care. As the authors never clarified the team and practitioner approaches, nor defined total patient care, their findings are somewhat diffuse and difficult to assess.

Strilaeff (1978) presented results of a small survey conducted in a Canadian hospital to explore the relationship between ward organization (defined as either team, functional, or total patient care) and nurse turnover. Her definitions of these modes were not clearly differentiated, although total patient care was said to involve the assumption, by each staff nurse on a team, of total care for a number of patients. Strilaeff found no significant difference in the disposition to leave according to the type of ward on which nurses worked, but tentatively concluded that nurses in total patient care settings may tend to leave their jobs because assignment to the same patients over an extended time makes their work unchallenging and routine. This hypothesis is interesting because it is in direct contradiction to statements in the primary nursing literature concerning the beneficial effects of primary nursing on job satisfaction and turnover.

In summary, the descriptive-evaluative literature on organizational modes other than primary nursing contained one survey of team nursing which indicated some of the problems which may arise under that mode, and seven evaluative case studies of modes combining elements of primary nursing, team nursing, and unit assignment. Two of these discussed the creation of a new nursing role on the unit. All of the case studies presented positive findings regarding these innovative modes. In addition, two surveys of a mix of innovative organizational modes were reviewed briefly.

RESEARCH LITERATURE

Team Nursing Compared to Other Modes

Four recent research reports compared innovative organizational modes with team nursing. Kelly and Lambert (1978) described a study conducted at the Medical Center Hospital of Vermont in Burlington, in which traditional team nursing was compared to a modified form of team nursing on a number of measures. Traditional team nursing was defined as a system in which rotating team leaders supervise teams of at least one registered nurse and a number of licensed practical nurses and aides. In this traditional mode, patients are often assigned to teams on the basis of unit geography. In contrast, in modified team nursing one lead nurse is assigned permanently to head a team consisting of only registered nurses and licensed practical nurses. In this modified form of team nursing, patient assignments are made on the basis of patient needs and the workload of the team. The permanent team leader has responsibility for a group of up to 10 patients, is permitted to work flexible hours, and is freed from administrative functions on the unit.

The investigators examined the differential effects of the two organizational modes on the following components: (1) planning for patient care, (2) implementation of care plans, (3) communication among team members, (4) communication with patients and families, (5) patient-nurse interaction, (6) nurse satisfaction, (7) patient satisfaction, and (8) quality of the administrative system. The design of the study was quasiexperimental. It combined a static group comparison (Campbell and Stanley 1963) of an experimental modified team nursing unit and a control traditional team nursing unit over a one-year period, with a pretest-posttest control group design without randomization, in which patient and job satisfaction measures were taken before the project began and then at regular intervals throughout the study period.

A number of data collection methods were used; sample selection procedures and sampling rates were not specified. A retrospective chart audit was performed on 60 records to assess care planning. Communication was evaluated by means of interviews with staff, and the stability of the patient-nurse interaction appears to have been assessed by recording the numbers and identities of staff caring for each patient. Job satisfaction was measured using a 12-item needs satisfaction questionnaire developed by Porter (1961), which was applied to an unspecified number of subjects before the project began and three, six, and nine months after the first measurement. Patient satisfaction was assessed by means of a structured interview at regular intervals throughout the study period, for a total of 130 interviews. The effectiveness of the new organizational mode as an administrative system was evaluated by reviewing time schedules with the head nurse. The reliability and validity of the various instruments used were not discussed, although the investigators cited a reference for the job satisfaction instrument.

Analysis of study data using mean scores, percentages, and analysis of variance indicated that planning for patient care had improved with the modified team approach, although implementation of the care plan was not consistently documented. Communication among team members did not appear to improve, although communication with patients and their families was substantially better. Stability of the nurse-patient interaction was not demonstrated, nor was increased job satisfaction on the experimental unit. However, patient satisfaction or, more specifically, their knowledge of their illness and discharge plans and their ability to identify the staff members caring for them, increased with the modified team approach. The validity of the new organizational mode as an administrative system was not demonstrated.

The investigators concluded that the data provided no conclusive answer to their research question; i.e., how does a staffing pattern which provides for a stable patient-nurse interaction influence patient care and nurse satisfaction. They attributed this lack of conclusiveness in part to the fact that stability of the nursing team was not consistently attained. Although each patient was permanently assigned to a team for his entire stay on the unit, this assignment did not decrease the number of people providing care. In general, the investigators felt that their study had been rendered inconclusive by the participants' failure fully to understand the project philosophy, by the team leaders' lack of necessary leadership qualities, and by the inadequate attention given to the theory and process of change.

Harrington and Theis (1968) and Theis and Harrington (1968) contrasted an innovative organizational mode with team nursing by focusing on the perceptions of baccalaureate nurses at the Loeb Center for Nursing and Rehabilitation. They compared this mode with the nursing organization at two traditional hospitals and studied institutional conditions which either helped or hindered the nurses in carrying out their professional functions. In the comparison hospitals, team nursing was the prevalent mode of nursing, although functional nursing was practiced on some units and on the evening and nights shifts on all units. Eighteen nurses from one of the comparison hospitals, 13 nurses from the other hospital, and 15 nurses from the Loeb Center were interviewed to ascertain perceptions about their ability, within their respective institutional setting, to carry out the five functions of professional nursing identified by Simms (1964). The reliability and validity of the interview instrument were not discussed. Data analysis was descriptive and comparative, and ten categories of institutional factors were distinguished by means of content analysis. Since the groups of subjects from the two comparison hospitals did not differ significantly from each other in their responses, the data from these two groups were combined.

The investigators found that three of the ten identified categories of institutional factors accounted for approximately two-thirds of the responses by both groups of nurses, i.e., expectations and attitudes of professional and nonprofessional personnel, work assignment, and communications. The most interesting finding was that nurses at the comparison hospitals identified the majority of factors in their work environment as deterrents to professional practice, while the nurses at Loeb identified the majority of factors in their work environment as helping them to fulfill their professional role. The investigators further found that most of the nurses in the comparison hospitals were frustrated, passive, and lacked challenge, while the Loeb nurses were enthusiastic, self-directed, and satisfied in their work. The investigators concluded that

> ...the prevailing attitudes and expectations of administrative and supervisory personnel, the nature of the work assignment,

> and the quality and amount of work-related communications are major factors that influence the baccalaureate graduate's ability to perform the five functions of professional nursing (Harrington and Theis 1968, p. 234).

They related the stimulation and satisfaction which nurses obtain from their work to the extent to which the work environment allows them to use their professional knowledge and skills, and the extent to which their concepts of nursing agree with the specific demands of their work. The investigators recommended changes in the work assignment of nurses in "typical" work settings and a reevaluation of the team nursing pattern as currently implemented.

Sjoberg and Bicknell (1969) and Sjoberg et al. (1971) used team nursing as a standard of comparison in a study of the unit assignment system practiced at University Hospital, Saskatoon, Saskatchewan. As defined earlier in this chapter, unit assignment is a method of decentralized ward organization in which the ward is divided into intense, above average, average, and minimal care units corresponding to patient needs for nursing care. Team nursing at University Hospital was described as a synthesis of the case and functional methods, in which the head nurse delegates to two or three registered nurse team leaders part of the responsibility for coordinating and supervising nursing care. Each team is made up of professional and nonprofessional staff and shares responsibility for the care of a group of patients.

Sjoberg and Bicknell (1969) first reported on a pilot study conducted to implement this organizational mode, to compare it to team nursing, and to evaluate its effects on staff utilization in direct and indirect care, on the standard and cost of patient care, and on staff satisfaction. A longitudinal study design was employed in which one 48-bed neurosurgical-ophthalmological ward was selected as the experimental ward and measurements were taken before and after the introduction of unit assignment. This research design can be described as a quasiexperimental, one group pretest-posttest design (Campbell and Stanley 1963).

A variety of data collection methods was used. To evaluate the utilization of nursing personnel and the amount of care received by patients, a direct care study was conducted with continuous in-room observation of 656 patients, both before and after implementation of unit assignment, as well as an indirect care study using work sampling observations of nursing personnel on seven day shifts. Quality of patient care was assessed by means of a questionnnaire completed by data collectors after observing and interviewing patients on the study ward; the questionnaire was to determine how well patient needs were met in the following areas: personal hygiene; activity; elimination; therapy; psychosocial security aspects; physical security; nutrition; and rest and sleep. This evaluation as well was made both before and after unit assignment was introduced; it lasted two weeks each and included approximately 200 patients. Nursing staff satisfaction was measured under unit assignment only. A self-administered questionnaire was given to all nursing staff members on the ward, although each staff level received a slightly different instrument. Responses were received from 31 staff. Costs were compared in relation to actual daily patient loads.

Sampling techniques used to obtain the sample groups for the direct care study and the quality of care assessment were not specified in the report, but all questionnaires were included as appendices. Although the validity of the study instruments was not mentioned, satisfactory interrater reliability statistics for 11 of the 16 standard-of-patient-care measures were given. Analysis of study results was conducted using the chi-square test, the Mann-Whitney U-Test, and the Wilcoxon matched pairs-signed ranks test.

The investigators found that under unit assignment, the skills and training of the nursing staff appeared to be better utilized in the provision of direct care. Time spent by the staff in travel and supply activities was minimal. High standards of patient care were observed more consistently under unit assignment, particularly in the areas of personal hygiene, activity, psychosocial security, and rest and sleep. Patients with above average nursing needs received significantly more care under the new system. The nursing staff appeared to be satisfied with the increased opportunity of patient contact under unit assignment. The cost of staffing the ward under unit assignment was found to be no greater than under team nursing, and supply costs were lower. Other perceived advantages of unit assignment not measured by the study instruments were less fragmentation of care due to fewer staff involved in each patient's care, better ward organization, more direct communication, better supervision of auxiliary personnel, and the provision of the appropriate amount of care to patients requiring close observation and constant attention. Based on these findings, the investigators concluded that the unit assignment system had been demonstrated on a pilot basis to be operationally viable and to be superior to the team mode of organization. They recommended implementation of unit assignment on other wards in the hospital and continued evaluation of the system.

On the basis of these recommendations, a second study of the unit assignment system was undertaken (Sjoberg et al. 1971) to determine whether the unit assignment system, when tested in several wards, would prove to be superior to team nursing, as indicated in the single ward pilot study. As in the pilot study, the investigators measured the effect of the organizational mode--team nursing or unit assignment system--on five dependent variables: staff utilization, direct care provided to patients, standard and cost of patient care, and level of nurse satisfaction. A longitudinal research design was used again, with three experimental wards first studied under team nursing and then after implementation of unit assignment. The study setting was a 49-bed medical ward, a 44-bed medical ward, and a 49-bed surgical ward.

Data collection procedures were essentially the same as those in the pilot study. Direct care data on 1487 patients were obtained by means of continuous observation of patients. Data on staff utilization and direct care were obtained by work sampling techniques for fifteen 24-hour periods on each study ward. Standards of patient care were assessed for 275 patients on each ward, using the same observation and interview technique as in the pilot study, but excluding the area of physical security. Staff satisfaction was measured with the same self-administered questionnaires, which were completed by 83 staff members before and by 94 staff members after the introduction of unit assignment. Cost data, including numbers and categories of staff on each ward on each shift, average hourly wages, and direct care hours required by each ward per day were monitored for fourteen months. Assessment of interrater reliability for the standard of care measurement revealed that only two of the seven questionnaire scales were rated consistently by the observers; no other mention of reliability and validity aspects was made in the report, nor were sampling techniques specified. Data were analyzed by comparisons of relative percentages, the Mann-Whitney U-Test, chi-square contingency tests, and linear regression methods.

The nursing staff was again found to be more effectively utilized under unit assignment and to spend more time in patient care and less time in travel and supply activities. There was an increase in the frequency with which nursing staff functioned at the appropriate skill level, and communication among staff had become more direct. The change in method of patient assignment resulted in less fragmented care, and grouping patients according to their need for care resulted in a more rational allocation of the amount of care given to each patient category. A higher and more consistent standard of patient care, particularly in the areas of personal hygiene, activity, psychosocial care, and rest and sleep, was found to be provided under unit assignment as compared to team nursing. Staff reactions to the new system were also very favorable. Staff members reported that they were better informed about their patients' conditions and treatments plans and that they were able to provide more personalized care. They reported fewer interruptions in their work and less variation in their workload. Findings concerning costs under the unit assignment system indicated lower staffing costs on both medical wards, although there was no change in total staffing costs on the surgical ward. On all three study units, increases in service staff costs and in float staff utilization were balanced by the decrease in staffing costs, with the added advantage of equalization of the daily work load among the nursing staff. Savings in supply costs were also realized on the three study units after implementation of the unit assignment system.

Based on these findings from three study wards, the investigators concluded that the unit assignment system can make efficient and effective use of professional and nonprofessional nursing staff, ensure consistent provision of a high level of care and a higher level of job satisfaction for nursing personnel, and provide a means for controlling staffing and supply costs. The investigators felt that unit assignment could solve many of the problems of traditional methods of ward organization and recommended its adoption in the entire study hospital.

In a related study, Philips (1975) conducted a study at Holy Family Hospital, Saskatoon, Saskatchewan, to document the effect of the unit assignment system on staff utilization and delivery of patient care, and to determine whether the benefits to the system identified in the research by Sjoberg et al. were realized at Holy Family Hospital. The study was carried out on one medical ward and one surgical ward which had previously practiced team nursing. Unit assignment was implemented at the study hospital with two modifications from the original system implemented and studied by Sjoberg et al., i.e., a larger number of patients in each unit, and no additional service staff on the ward.

The methodology used by Philips was similar to that in the earlier studies, although continuous observation of direct patient care on the study wards was omitted. A work sampling study of nursing staff activities was carried out on both wards, and patient, nursing staff, and medical staff opinions of nursing care on the wards were elicited by means of questionnaires which contained some of the same questions used by Sjoberg et al.

The data collected were generally supportive of the unit assignment system. Philips found that the nursing staff spent more time in patient centered activities under unit assignment and that a larger proportion of patient care was provided by professional staff, especially on the evening and night shifts. Job satisfaction of the nursing staff appeared to be high, with only three staff members expressing a preference for team nursing. Both physician and patient reactions to care under the unit assignment system were generally favorable. Based on these findings, Philips concluded that the unit assignment system as implemented at Holy Family Hospital was a viable and effective method of ward organization.

Functional Assignment Compared to an Innovative Mode

Christman (1971) compared the quality of care by baccalaureate nurses under "unit management patient care assignment" with that under functional patient care assignment. The study report is flawed, however, by Christman's failure to distinguish between these two organizational modes or staffing patterns, other than stating that the functional method is task oriented while the unit management method is patient centered. The study set out to test two hypotheses: the quality of performance of baccalaureate nurses will be negatively correlated with the amount of time spent working in settings where the functional method of patient care assignment is used; and the quality of performance of baccalaureate nurses working in functional patient care assignment settings will be lower than that of baccalaureate nurses working in unit management patient care assignment settings.

Four hospitals in the Detroit area were selected for study, two of which used the functional concept of patient care assignment; the other two used the unit management concept. The Slater Nursing Competencies Rating Scale (Slater 1967) was applied to 26 nurses in functional settings and 16 nurses in unit management settings. Reliability and validity of the scale were not discussed, although a reference to the scale was cited. Also, the study subjects were selected on the basis of availability rather than by random sampling techniques, a fact which the investigator acknowledged as a limitation to the study. She also recognized her inability to measure the influence of nurses' prior employment experience on their performance. The Slater Scale scores were analyzed using a t-test; subscores based on the seven components of nursing defined by Kreuter (1957) were calculated as well. Analysis of these subscores helped to identify areas where lower levels of nursing performance existed.

The investigator found an independent relationship between level of performance and length of employment in both organizational settings. Thus, the first hypothesis was not supported. No correlation was found between performance and years since graduation, although recent graduates scored higher in unit management settings than in functional settings. The fact that subjects in the functional settings had a significantly lower mean score on the Slater Scale than subjects in the unit management settings supported the second hypothesis. Analysis of subscores revealed generally low scores in both types of settings for teaching, rehabilitation, and patient involvement in the care process, although unit management nurses scored higher than the functional nurses in these areas. Christman concluded that the unit management setting allowed the baccalaureate nurse to function at a higher level of competency and to provide more individualized patient care than did the functional method of care. The above-mentioned failure to define the two organizational modes, however, limits the significance of this conclusion.

In summary, the research literature on organizational modes other than primary nursing contains four studies comparing an innovative mode with team nursing. One study, comparing modified team nursing and traditional team nursing with respect to nurse satisfaction, patient satisfaction, care planning, and communication was inconclusive. Another study comparing the Loeb Center system of total patient care with team nursing found that Loeb Center was superior with respect to the ability of nurses to fulfill professional nursing roles. Two studies comparing the unit assignment system with team nursing concluded that unit assignment was superior with respect to utilization of staff in direct and indirect care, quality of care, staff satisfaction, and cost. Finally, a study comparing a task centered with a patient centered nursing mode judged the patient centered mode better in fostering individualized care and nursing competency. It should be noted that with the exception of some discussion of interrater reliability, neither the reliability and validity of study measures nor other important methodological issues were addressed in any of these reports.

SUMMARY AND IMPLICATIONS: TEAM NURSING, THE LOEB CENTER SYSTEM, AND UNIT ASSIGNMENT

The purely descriptive literature on organizational modes other than primary nursing was largely confined to discussions of the definition, philosophy, and advantages of team nursing, of the Loeb Center system of total patient care, of the unit assignment system, and of other innovative modes featuring elements of these. Only the articles on team nursing discussed potential problems of that mode, while most other articles favored the modes under discussion. The descriptive-evaluative literature, again excepting one survey of team nursing, was also extremely positive in its discussions of modes combining elements of primary nursing, team nursing, and unit assignment. However, the claims that improvements in patient satisfaction, nurse satisfaction, quality, amount of direct care provided, absenteeism, turnover, and cost savings resulted from the various innovative modes discussed were insufficiently supported by the informal evaluation methods used.

In the research literature as well, and with the exception of Kelly and Lambert's (1978) inconclusive comparison of traditional and modified team nursing, the innovative modes under study were judged superior to traditional team and functional nursing on a number of measures. Specifically, they were said to result in improvements in nurses' opportunities to fulfill professional roles, job satisfaction, quality of care, amount of direct care provided to patients, staffing costs, and utilization of personnel. These findings, however, appear to have been obtained without sufficient attention to important methodological issues such as research design, sample selection, and instrument reliability and validity.

Most authors may well feel that the modes they implemented and evaluated are superior to traditional or other innovative organizational modes. They failed, however, to address specific questions of staffing patterns (personnel mix) within the organizational modes proposed. Also, the literature seems overly concerned with the question of the superiority of specific modes over others. A more important question which the literature has so far failed to address concerns the appropriateness of specific modes for specific settings and conditions. As Munson and Clinton (1979) suggested, one cannot assume that one type of nursing organization is best in all situations. Rather, selection of a mode should be based on careful consideration of the large number of variables on a patient unit. These may include patient mix and socioeconomic status, type of service (medical, surgical, pediatric, etc.), nurse staffing levels, staffing budget, type of hospital, philosophy of nursing, strength of leadership, educational preparation and experience of nursing staff, and many other variables. Until these issues are addressed, questions as to which organizational modes should be implemented cannot be fully or definitively answered.

PRIMARY NURSING CARE

The focus of this section is the literature on primary nursing care. This mode of care evolved in the late 1960s, and thus was not discussed by Aydelotte (1973) or Georgopoulos (1975) in their reviews of literature prior to 1970. The Medicus report on nursing productivity by Jelinek et al. (1976) did review several chiefly descriptive works on primary nursing, indicating favorable results of the new mode. Jelinek et al. pointed out, however, that no systematic, controlled research into the differences between team and primary nursing had been conducted.

Definitions of primary nursing are not uniform throughout the literature, but virtually all articles and reports on the subject stress that basic requirements are autonomy, authority, and accountability in the primary nurse's role. Manthey et al. (1970) defined primary nursing as a system in which responsibility and accountability are incorporated in the case method philosophy. In the primary nursing organizational structure,

> ...each RN and each LPN has primary responsibility for the total nursing care of an assigned group of from three to six patients. She performs all the daily care tasks for her patients, taking their vital signs, giving them morning care, administering their medications, performing their treatments, preparing them for tests ...(p. 70).

Ciske (1974a), with Manthey another early supporter of the mode, identified five elements as essential to primary nursing. Each patient is assigned to his own primary nurse who provides all of the patient's care each day she is on duty for the duration of the patient's stay on the unit. Patient assessment and discharge planning are the responsibility of the primary nurse, who also plans the care to be provided in her absence by an associate or secondary nurse. The primary nurse thus has 24-hour responsibility for her patients' care, which is implemented through the care plan and other written communications. The patient is involved in his own care, and communication between care givers is stressed.

It should be noted here that primary nursing, an organizational mode for inpatient units, is distinct from primary care, which refers not to inpatient settings but to the first care given at the point of entry into the health care system (Hegyvary 1977).

Differences in how primary nursing is defined and put into practice appear to center around staff mix, size of patient load carried by the primary nurse, and the method of patient assignment, rather than on the generally accepted issues of autonomy, authority, and accountability. Unfortunately, many of the descriptions in the literature of how primary nursing is conceived and practiced are brief and lack detail, thus making comparisons among settings difficult. No author provided an operational definition of primary nursing, i.e., one in which 24-hour responsibility, authority, and other elements of the mode were described in measurable terms.

There are variations in the settings in which primary nursing is practiced. The most common setting is the medical-surgical unit in medium-sized acute care hospitals, but there are also reports of primary nursing in hospitals of all sizes and on a range of units in different departments (Engstrand 1977), short-stay surgical care (Ojeda 1976; Maun 1979), nephrology (Leonard 1975), dialysis (Conlon, Feigenbaum, and Lamb 1976), psychiatric care (Ryan, Gearhart, and Simmons 1977), pediatric care (Felton 1975b; Hymovich 1977), obstetrical-gynecological care (Keane 1974; Alfano et al. 1976), and coronary care (Medaglia 1978), as well as in the operating room (Latz, Mayer, and Bailey 1979).

In the following, a brief overview is given of both the descriptive and the descriptive-evaluative literature. Following this, a more detailed review and critique of 33 research reports on primary nursing is presented.

DESCRIPTIVE LITERATURE

The majority of the literature on primary nursing is descriptive. Of the 157 articles and reports on primary nursing included in this review, 88 can be considered purely descriptive. The most common type of article in this category is the "case study." The literature search yielded the following 24 articles of this type, listed in reverse chronology:

McGreevy and Coates (1980)
Allen (1979)
Grypdonck et al. (1979)
Maun (1979)
Jefferson (1978)
Medaglia (1978)
Osinski and Morrison (1978)
Selleck (1978)
Weiss (1978)
Engstrand (1977)
Pisani (1977)
Alfano et al. (1976)
Conlon, Feigenbaum, and Lamb (1976)
Ojeda (1976)
Bakke (1974)
Robinson (1974)
Knecht (1973)
Logsdon (1973)
Maas (1973)
Manthey (1973)
Martin et al. (1973)
Mundinger (1973)
Schlegel (1973)
Manthey et al. (1970)

it should be noted that Allen (1979) and Osinski and Morrison (1978) reported on the simultaneous introduction of primary nursing and an all-RN staff.

The typical case study article described an experimental or pilot primary nursing unit which, after a "successful" trial period, was used as a model for implementation of primary nursing in other areas of the hospital. Although favorable outcomes of primary nursing, including increases in patient satisfaction, nurse satisfaction, and quality of care were often stated or implied in these articles, no mention was made of any effort to measure these outcomes objectively. Rather, subjective assessments by those responsible for implementation appeared to be the norm.

In addition to articles describing how primary nursing was practiced on one unit, there also is a large number of articles devoted chiefly to discussions of the philosophy and principles of primary nursing, its potential advantages and benefits, and the general role of primary nursing in health care. Thirty-three articles of this type were reviewed:

Anderson and Choi (1980
Brown (1980a,b,c)
Brown et al. (1980)
Ciske (1980a,b)
Condon (1980a)
Kahn (1980)
Manthey (1980)
Smith, C.C. (1980a)
Steckel (1980)
Van Servellen (1980a,b)
Ciske (1979)
Clifford (1979)
Nodolny (1979)
Spitzer (1979)
Van Eindhoven (1979)
Dickerson (1978)
Wisener (1978
Wobbe (1978)
Ciske (1977)
Ferguson (1977)
Hegyvary (1977)
Marram (1977)
Russell (1977a)
Smith, C.C. (1977)
Brown (1976)
Ciske (1971)
Marsh (1971)
Sarosi (1971)
Smith, V. (1971)

The following primary nursing articles focused specifically on the process of change in the implementation of primary nursing:

Condon (1980b)
Hybben and Rackman (1980)
Smith, C.C. (1980b)
Nyberg and Simler (1979)
O'Leary (1977a)
Romero and Lewis (1977)
Wolff (1977)
Anderson, M. (1976)
Nehls et al. (1974)

Four articles discussed the role of the head nurse in primary nursing (Page 1974; Mealy et al. 1976; Bartels, Good, and Lampe 1977; Zander 1977), and a series of more specific articles focused on a range of areas of nursing and hospital care as related to the primary nursing mode. These included the role of the student (Weisensee

1971; Hall 1977; Salyer and Sloan 1978; Moritz 1979) and of the clinical specialist (Previte 1979); staff education (Mundinger 1977); all-registered nurse staffing (Cicatiello et al. 1978); peer review (Michaelson 1980); the problem-oriented medical record (Prendergast 1977); the pharmacy department (Sobczak 1977); operating room nursing (Latz, Mayer, and Bailey 1979); nephrology nursing (Leonard 1975); prenatal nursing (Keane 1974); patient care conferences (Mayer and Bailey 1979); and role stresses of nurses (O'Leary 1977a). Finally, mention should be made of Ganong and Ganong's (1977) workbook and management guide to understanding and implementing the concepts of the new mode.

In summary, there is quite an extensive body of purely descriptive literature on primary nursing. Roughly categorized as containing case studies, general philosophical articles, and discussions of specific areas of nursing as they relate to the mode, most articles implied that primary nursing is superior to other modes, although no evaluation results were presented in support of this conclusion.

DESCRIPTIVE-EVALUATIVE LITERATURE

Articles which were mainly descriptive but which also presented some evaluation results typically described a case study of the implementation of primary nursing on one unit and in addition reported efforts to measure one or several effects of the experimental nursing mode. In all of these case studies, however, discussion of instrument reliability and validity and other methodological issues was at best cursory. Three described the implementation of primary nursing in conjunction with all-RN staffing (Marram 1973; Dahlen 1978; Osinski and Powals 1978). It should be noted that many of these articles discussed primary nursing in relation to several outcomes (e.g., Osinski and Powals 1978) and will be referred to repeatedly in context.

The most common type of evaluation centered on patient perceptions and patient satisfaction with care and was carried out by means of self-administered patient questionnaires. The following 15 articles describing this type of evaluation were reviewed:

Howard, Glass, and Stutzman (1980)
Beltran et al. (1979)
Miller (1979)
Rennicke (1979)
Walleck (1979)
MacKinnon (1978)
McCarthy and Schifalacqua (1978)
Osinski and Powals (1978)
Rye (1978)
Bolder et al. (1977)
Corn, Hahn, and Lepper (1977)
Nenner, Curtis, and Eckhoff (1977)
Russell (1977b)
Ciske (1974b)
Marram (1973)

In most cases the questionnaires were designed by the authors or by other nurses involved in the primary nursing experiment. The use of patient and family interviews to elicit perceptions of primary nursing was also reported (Manthey and Kramer 1970). The results of these evaluations of patient reactions to primary nursing were uniformly favorable to the new nursing mode.

Another type of evaluation common in the descriptive-evaluative literature concerned nurse satisfaction and perceptions of the new mode. Thirteen articles described this type of evaluation singly or in conjunction with patient satisfaction:

- Howard, Glass, and Stutzman (1980)
- Beltran et al. (1979)
- Walleck (1979)
- MacKinnon (1978)
- Osinski and Powals (1978)
- Rye (1978)
- Arnsdorf (1977)
- Corn, Hahn, and Lepper (1977)
- Nenner, Curtis, and Eckhoff (1977)
- Olsen (1977)
- Russell (1977b)
- Spoth (1977)
- Marram (1973)

Again, self-administered questionnaires devised by those involved in the implementation of primary nursing were the major methods of evaluations, although open-ended, taped group discussion (Spoth 1977) and other, unspecified methods (Nenner, Curtis, and Eckhoff 1977) were reported as well. Once again, results of the evaluations were entirely supportive of primary nursing.

Another potential outcome of primary nursing discussed was cost savings. Eagen (1970), Werner (1977) and Fairbanks (1977) reported that primary nursing on pilot units was no more costly than team nursing on comparable units. Similarly, Dahlen (1978), Marram (1973) and Osinski and Powals (1978, 1980) described cost comparisons of primary nursing units having all-RN staffs with other units having a full mix of staff. Primary nursing was reported to be no more costly than other organizational modes. Williams and Stewart (1980) reported no appreciable increases in personnel and operating costs, except those resulting from inflation, when a pilot unit changed from team to primary nursing, and Nobel and Dods (1980) found a decrease in supply costs under primary nursing. Only Howard, Glass, and Stutzman (1980) found that costs increased slightly with primary nursing. None of these discussions provided details on cost comparisons, however.

Costs were also discussed in terms of staff turnover and hours of nursing care provided. Isler (1976), Donahue, Weiner, and Shirk (1977), Eagen (1970), Ryan, Gearhart, and Simmons (1977), Brown (1980d) and Nobel and Dods (1980) reported general decreases in turnover after the implementation of primary nursing; Ciske (1974a,b) reported a dramatic decrease in turnover for registered and licensed practical nurses but a slight increase in turnover for nursing assistants. LaViolette (1979b), in her general discussion of primary nursing, presented evaluation results from several studies indicating decreases in nurse turnover with the advent of primary nursing. Osinski and Powals (1978), while evaluating primary nursing with all-RN staffing, found a decrease in turnover and a lower absenteeism rate at their institution than at another area hospital practicing functional nursing. Isler (1976) also reported decreases in absenteeism and sick time and Nobel and Dods (1980) reported decreases in sick time.

Findings concerning hours of care provided under primary nursing were less unanimous. O'Leary and Hill (1977) reported an increase in "productive" nursing care hours per day as a favorable outcome of primary nursing in conjunction with cyclical staffing patterns. Brown (1980d) found more registered nurse care hours per patient day on primary than on "traditional" units, but acknowledged that the primary units had a higher proportion of registered nurses. On the other hand, Osinski and Powals (1978) reported a decrease in nursing care hours per patient under primary nursing with an all-RN staff and viewed this as an indication of increased efficiency in the provision of high quality care. No data to support this conclusion were provided. Similarly, Ryan, Gearhart, and Simmons (1977) found a decrease in the number of hours of "continuous nursing care" provided on a primary unit in the psychiatric setting. They interpreted this finding as a positive outcome of primary nursing in that it reflected a decrease in patient disturbance.

In addition to patient satisfaction, nurse satisfaction, and cost, other variables were informally evaluated and positive outcomes of primary nursing reported. These included:

Physician perceptions (Bolder et al. 1977; Russell 1977b; MacKinnon 1978; Osinski and Powals 1978);

Nurse professional goal accomplishment (Ciske 1980c);

Patient length of stay (Brown 1980d; Nobel and Dods 1980);

Patient knowledge (Condon, Johnson, and Oliver 1975);

Number of patient incidents (Eagen 1970; Ryan, Gearhart, and Simmons 1977; Nobel and Dods 1980);

Number of pain medications taken (Futch 1978);

Occupancy levels (Isler 1976; Brown 1980d);

Quality of charting (Manthey and Kramer 1970; Corn, Hahn, and Lepper 1977; Beltran et al. 1979; Nobel and Dods 1980; Howard, Glass, and Stutzman 1980; Williams and Stewart 1980);

Overall quality of nursing care (Elpern 1977; Beltran et al. 1979; Howard, Glass, and Stutzman 1980; Williams and Stewart 1980).

Again, however, findings were incompletely reported and descriptions of the instruments used to measure these outcomes were sketchy at best. Also, as in the purely descriptive literature, primary nursing outcomes were evaluated by those responsible for implementing the new mode.

In summary, then, while the extensive descriptive-evaluative literature on primary nursing is overwhelmingly favorable with respect to the new nursing mode, the methodological weakness of the evaluation efforts, lack of quantitative analysis, and possible bias of those conducting the evaluations render these findings questionable.

RESEARCH LITERATURE

Exploratory Studies

Several of the 33 reports of research efforts on primary nursing constitute exploratory, noncomparative studies undertaken chiefly to define variables and clarify the process of primary nursing.

Manfredi (1976), reporting on a carefully designed and executed participant observation study, described the process of changing from a traditional delivery system to primary nursing and outlined a model of primary nursing for nursing service administrators. After careful selection of a theoretical framework and an appropriate research setting, the investigator spent four months in the study hospital collaborating with the nursing staff in the change to primary nursing. In this role, she was able to observe factors which facilitated or inhibited the implementation of primary nursing and the effects of the mode on patients, personnel, and the organizational structure of the nursing department. Manfredi found that although a sense of tension is necessary, organizational climate, policies, and leadership instability may hinder the change to primary nursing. On the other hand, Manfredi suggested that primary nursing may have a positive effect on staff satisfaction and quality of care. She concluded her report with a model of primary nursing, stating its philosophy, objectives and roles, and stressed the value of employing a change model, with a designated change agent, for the implementation of primary nursing.

Bailey and Mayer (1980) conducted a survey of fourteen medical-surgical wards at the Minneapolis Veterans Administration Medical Center. They attempted to assess five major aspects of primary nursing -- accountability of the primary nurse, accountability of the head nurse, ability of the patient to identify his primary nurse, communication patterns among staff, and quality of patient care conferences -- by means of six instruments developed by the investigators. Instrument reliability and validity were not evaluated. The data indicated that nursing staff members had a cognitive understanding of the primary nursing concept and could usually identify appropriate communication methods. Bailey and Mayer found that written forms of communication were used by most nurses to ensure continuity and accountability, and that all patients included in the study had been assigned to a primary nurse. The major value of this study was that it revealed areas of primary nursing in need of further development, such as consistency of nurse-patient assignment, accountability of primary nurses in care planning, and patient care conferences. The authors concluded that the evaluation study had provided an important stimulus to the process of primary nursing implementation in their hospital.

Watts and O'Leary (1980) conducted an exploratory study at Bayfront Medical Center, St. Petersburg, Florida, which surveyed nurses' perceptions of the following components of primary nursing: accountability, advocacy, assertiveness, authority, and autonomy, in conjunction with collaboration, continuity, communication, commitment, and coordination. These components had been identified by means of a literature review, but no attempt was made to define them in measurable terms. Instead, the ten components were divided into two groups on the basis of the first letter in each word (A's and C's), without any convincing rationale that the components logically fell into two discrete groups. Nurses' perceptions of the importance of the components, and the extent to which they actually existed, were measured by means of a self-administered questionnaire. Acceptable instrument reliability coefficients and some evidence of its face validity were presented, but the validity of component grouping was not addressed.

The investigators found that of the five "A" components, nurses ranked accountability first in both perceived importance and existence; of the five "C" components, communication was ranked first. Some differences were found between perceived existence and perceived importance for the other components of primary nursing; differences were also found in questionnaire scores by level of education and type of nurse training, but were not tested for statistical significance. Although the investigators discussed some limitations in questionnaire format, the most obvious limitation to this exploratory study, the arbitrary grouping of components, was not discussed, leaving some doubt as to the usefulness of findings.

A fourth exploratory study, conducted by deWever (1980) at the Veterans Administration Hospital, San Antonio, Texas, attempted to determine the variables which affect nurses' selection of primary patients and their ratings of the quality of their relationships with these patients. One hundred nurses selected at random were interviewed to identify personal characteristics, patient characteristics, and factors in the work environment which were perceived to influence patient selection. The nurses were also asked to evaluate their relationships with patients on a scale of 0 to 10. No mention was made in the report of the validity and reliability of the interview schedule used. The relative importance of the variables was tested by a chi-square test of significance, and those related to the nurse's prior knowledge of the patient were most frequently cited as influencing the decision to select a specific patient. Furthermore, the quality of the nurse-patient relationship appeared to be affected by its duration.

Comparative Studies

The bulk of research efforts in the area of primary nursing is represented by studies comparing this mode with another organizational mode, usually team nursing, with respect to a number of dependent variables, such as patient and nurse perceptions, quality, and other outcomes. Two basic weaknesses pervade this literature: the investigators' failure to define primary nursing and other organizational modes in operational terms, and their failure to use a valid experimental research design or adequate experimental controls.

Perceptions of primary nursing and other modes

Several of these comparative studies focused solely on perceptual outcomes of primary nursing. Daeffler (1975, 1977) concentrated specifically on patient perceptions of their care. Referring to a theoretical framework of expressive and instrumental nursing activities and patients' needs for expressive, emotionally supportive care, Daeffler hypothesized that primary patients would report fewer omissions in care than would team nursing patients. Primary nursing was defined in this report as a pattern in which the total care of a patient is assigned to one nursing staff member throughout the patient's hospitalization. Eligible patients on general medical-surgical units of a 160-bed community hospital were included in the sampling frame, with the final sample consisting of 52 patients from five comparable team nursing units and 30 patients from one primary nursing unit. All units were semiprivate, with a circular design.

Perceived omissions in six care categories were established by means of a 50-item checklist developed by the Division of Nursing Resources of the Public Health Service (Abdellah and Levine 1964). Patients also were asked several questions about their satisfaction with care. The reliability and validity of the instrument were not explicitly addressed, although the author stated that the checklist categories were lacking in internal consistency and the satisfaction items were lacking in sensitivity.

Daeffler reported that primary patients perceived fewer omissions in care than team nursing patients. Differences between the groups were significant ($p \leq .1$) in favor of primary nursing for 1 out of 6 care categories and 10 out of 47 individual checklist items. Primary patients appeared to be more satisfied with their care, scores on two of three satisfaction items being significantly higher for the primary group. The investigator concluded that the study hypothesis was at least partly sustained, and that primary nursing care appeared to satisfy patient needs for expressive, emotionally supportive care; the unresolved question of instrument reliability and validity, and the relatively few instances of statistically significant differences, detract from this conclusion.

Hymovich (1977) attempted to measure the effect of primary nursing on patient perceptions in the pediatric setting. The parents' perceptions of care were also elicited, as were those of nursing personnel. It was hypothesized that primary nursing would enable nurses to know their patients better and to meet their needs more completely than would team nursing.

To test this hypothesis, a quasi-experimental, one-group pretest-posttest design (Campbell and Stanley 1963) was used in which children, mothers, and nurses were interviewed on one unit before and after the implementation of primary nursing. A total of 42 children, 34 mothers, and 39 nurses were interviewed by means of two instruments previously developed by the investigator. One, a role perception inventory, attempted to measure perceptions of the instrumental (task related) and expressive (emotionally supportive) components of the nurse's role; it consisted of ten pairs of pictures from which respondents selected one in each pair reflecting care on the unit. The second, a role taking inventory, attempted to measure perceptions of the nursing role and role taking ability; it consisted of four captionless pictures about which respondents answered open-ended questions. No mention was made of the reliability or validity of these instruments.

Responses for the team nursing and the primary nursing periods were compared by means of an unspecified test of significance and revealed that under primary nursing, mothers were more satisfied and viewed the nursing role as significantly less instrumental than under team nursing. No statistically significant differences were found between the two modes in the perceptions of children and nurses, although under primary nursing "don't know" responses by children were half as many as under team nursing. A greater acceptance by children of medications and baths was found under primary than under team nursing. All respondents perceived the pediatric nursing role as more instrumental than expressive.

The investigator drew no conclusions regarding the differential effects of team and primary nursing on the perceptions of pediatric patients, mothers, or nurses. Also, the independent variable was not clearly defined, in that the duration of the primary nurse's responsibility, e.g., 24-hour responsibility from admission through discharge, was not mentioned. The dependent variables, specifically "nurse-child perceptions" and "role taking ability," were not defined, and although one of the instruments attempted a distinction between instrumental and expressive nursing activities, this distinction was not supported theoretically or conceptually. The brevity of the research report may account for some of these omissions.

The effect of primary nursing on patient and nurse perceptions was also addressed by Kocher 1976 in a small survey of 15 primary nurses in one hospital and 15 team nurses in another hospital. Nurse perceptions were elicited and compared by means of a 10-

question interview, and five patients in each hospital were interviewed about their care and their relationships with the nurses. Primary and team nursing were not defined in this report, nor was any mention made of the reliability and validity of the interview instrument used.

Kocher found that 14 of the primary nurses, as opposed to only 4 of the team nurses, rated their job satisfaction as high. Team patients reported that they were cared for by different nurses each day and that they had difficulty obtaining answers to their questions, while primary patients reported continuity in their care and satisfactory responses from nurses to their questions. However, these findings in support of primary nursing are not very convincing in view of the study's small sample size and lack of sample definition, and of its failure to define the independent variables and to test the instruments used.

A large study of the effects of primary versus team nursing on patient and nurse perceptions was reported by Cassata (1973). In this study, conducted on three team and three primary units each in two urban hospitals, primary nursing was defined as a care system in which one nurse takes primary, 24-hour responsibility and accountability for the care of three to five patients throughout their stay on the unit. Six dependent variables were defined: (1) patient satisfaction with nursing care, nursing staff, and medical staff; (2) patient affect ratings of their perceived nurse; (3) nursing staff perceptions of patient care; (4) nursing staff satisfaction with the hospital, station, and other staff; (5) nursing staff perceptions of physician-nurse communication; and (6) nursing staff perceptions of their organizational mode. Data were also obtained on a number of patient and staff characteristics.

Patient data were collected by means of a 43-item interview schedule containing questions on demographic characteristics, levels of satisfaction, and affect ratings of the perceived nurse. The sample consisted of the first 20 patients on each unit who had been there for at least 48 hours and who were considered to be well enough by the head nurse to be interviewed. A total of 240 patients participated in the study. Nursing staff data were collected with a 53-item self-administered questionnaire containing questions on background characteristics, job satisfaction, perceived effectiveness of the nursing system, and perceptions of patients. All full-time nursing staff members with the exception of permanent night shift personnel were included in the study. A total of 158 staff members, representing 94 percent of the eligible staff on the study stations, completed the questionnaire. Both instruments had been devised by the investigator, who made reference to informal efforts to maintain interrater reliability in the interviews and acknowledged that the patient satisfaction items were not suited to measure actual patient satisfaction. No formal assessment of the reliability and validity of the instruments appears to have been made, however.

Major findings based on frequency distributions and two-way analysis of variance for the six dependent variables indicated no difference in satisfaction between team and primary patients, but primary nurses were rated by patients as significantly more positive in affect than team nurses. There was no appreciable difference between primary and team staff perceptions of patient care but nurse satisfaction was higher for team than for primary staff. No statistically significant difference between team and primary staff perceptions of physician-nurse communication and between team and primary staff ranking of nursing role functions were observed.

In the light of these findings, Cassata concluded that development of and adaptation to the new organizational mode had created dissatisfaction and frustration among primary nursing staff members, manifested by poor staff communication, lack of trust, low morale, and a desire to leave the job. On the other hand, the affect scale ratings indicated that the primary nursing mode led to a more positive one-to-one relationship between patient and nurse.

This study and its conclusions are noteworthy for several reasons. First, since primary nursing had been established by the same nursing director in both study hospitals, there is evidence of comparability of the primary units examined. Second, extensive baseline data on both patient and staff characteristics were collected, allowing the investigator to demonstrate comparability of both patient and staff groups. Third, Cassata acknowledged that satisfaction studies are of little merit; because patients have minimal expectations of receiving personalized care, staff members needed to make only a minimal effort to satisfy patient needs. He concluded that better methods or criteria for evaluations of satisfaction are needed. Finally, quite negative findings concerning the effect of the new nursing mode on staff satisfaction were presented. Such outcomes of primary nursing are relatively rare in the literature, which generally depicts its effects in entirely favorable terms. The import of Cassata's findings, however, is weakened by the limitations of the study, specifically the choice of patient participants by the head nurses on the study units and, more importantly, the failure to test the reliability and validity of the study instruments.

Mills (1979), in a study conducted at the 600-bed University of Maryland Hospital, also compared the perceptions of patients and nurses on primary nursing units with those on team units. Specifically, this study attempted to determine the effect of the type of care delivery on staff member perceptions of job characteristics (autonomy, authority, accountability, job satisfaction) and of care (quality, continuity, individualization, completeness) on the one hand, and on patient perceptions of care (care provider, communication, consistency, individualization, patient participation in care) on the other. Primary nursing was defined as a delivery system in which one registered nurse assumes responsibility for planning care on a 24-hour shift for four to six patients throughout their hospital stay. Team nursing was defined as an assemblage of auxiliary nursing personnel, supervised by a registered nurse who provides nursing care to an individual or group of patients. Team nursing implies that the total care of each patient is shared by more than one staff member during each shift and 24-hour period, and that the care givers may change during the patient's stay on the unit.

To examine the relationship between the care delivery system and patient and staff member perceptions, an experimental research design was used in which six nursing units, matched on baseline variables, were randomly assigned to either control (team nursing) or experimental (primary nursing) treatment. Measurements were taken prior to and six months after random allocation.

Perceptual data were collected with questionnaires designed by the investigator. Convincing internal consistency and homogeneity values were given for the scales of both instruments. Data on unit staff and patient characteristics were also collected. All patients and registered nurse-licensed practical nurse staffs on the six units during the two data collection periods were asked to participate in the study. Thirty-four staff members (30 percent) responded to both the pretest and posttest questionnaire while 56 staff members (82 percent) responded only to the pretest instrument. One hundred and thirty patients (86 percent) responded to the pretest and 113 patients (75 percent) to the posttest questionnaire. Data analysis used the Kolmogorov-Smirnov and Wilcoxon matched pairs-signed ranks test to compare groups and to analyze differences between pretest and posttest responses.

Staff data indicated that primary nursing had resulted in significantly higher perceptions of authority, autonomy, and accountability on the part of the nurses. Statistically significant perceptual changes related to satisfaction, quality, continuity, individualization, and completeness of care were not found, however, except in isolated instances. Analysis of the patient data revealed no significant differences between types of unit in posttest responses, although comparison of pretest and posttest responses revealed substantial positive changes in individualization, communication, and participation in care for the primary nursing units. No changes were found over time in patient perceptions of the care provider and consistency of care.

Mills concluded that while primary nursing had some impact on nurse perceptions of authority, accountability, and autonomy, and, to a lesser extent, on patient perceptions of individualization, communication, and participation in care, the influence of the experimental delivery system on the study variables was not readily discernible. Mills suggested that the strengths of primary nursing may not lie in conventionally defined benefits but in outcomes which are less obvious and more difficult to measure.

The study by Mills is noteworthy in several ways. First, it was the only study in the primary nursing literature in which nursing units were randomly allocated to different organizational modes for purposes of the study. Thus, it represents one of the more objective evaluations of primary nursing available in the literature. Second, careful attention was paid to the internal consistency and homogeneity of the instruments used, thus providing evidence of content and concurrent validity, although the investigator pointed out the need for further testing and refinement of the instruments. Finally, this research was preceded by, and based on, careful review of the organizational and nursing literature and a conceptual framework of the nursing care delivery system.

Marram, Schlegel, and Bevis (1974) focused on the perceptions of and attitudes toward the primary nursing mode of patients, nursing staff members, physicians, and administrators. The study compared primary, team, functional, and case method units in two hospitals. In addition, perceptions of patients and nursing staff members were compared before and after the implementation of primary nursing on one unit. A detailed description of all four organizational modes was given. The basic components of primary nursing were defined as responsibility for total care of a patient and accountability for planning comprehensive, 24-hour care for the duration of hospitalization and for the period immediately after discharge.

The study population consisted of 360 patients (120 each from primary units and team units, and 60 each from functional and case method units) and 110 registered nurses and licensed vocational nurses (45 from primary units and a total of 65 from case method, team and functional units). The attitudes of 50 physicians and 7 administrators were also elicited. The sampling methods were not specified.

Four self-administered questionnaires were designed by the investigators, who do not seem to have addressed instrument reliability and validity. The patients were asked to state what they liked best about their nursing care and to describe their nurses, the nursing care, and their level of satisfaction on a five-point Likert scale. The nurse questionnaire asked nurses about their professional orientation and their satisfaction with the organization of their work. The administrator questionnaire, which was augmented by informal interviews with administrators, tapped attitudes toward primary nursing and opinions about its cost effectiveness. The physician questionnaire asked physicians to state their level of satisfaction with the current nursing care on each unit and to list the advantages and disadvantages of the different nursing modes. Informal comments were also recorded.

The major findings of the study, based on comparisons of percentages for the respective answers, were that primary nursing patients were more satisfied than other patients and more often cited individualized care as the best aspect of their care; primary nursing unit staff were more satisfied with the way in which their work was organized and were more professional in their work orientation than other staff; physicians were neither more nor less satisfied with primary nursing than with other modes; and administrators considered primary nursing as a workable way of organizing care. None of the latter considered primary nursing more costly than other modes and three out of seven said that it was less costly. The investigators concluded that primary nursing was a satisfying care system for both patients and nurses. Also, although administrators and physicians were not overwhelmingly in favor of the new mode, it was concluded that both groups would endorse primary nursing more often than not as compared to most other modes of nursing care.

These extremely favorable findings, particularly with respect to patient and nurse satisfaction, must be viewed with some reservation, however. No evidence of the comparability of study units, patient groups, or staff groups was given, nor were statistical tests used to demonstrate the significance of the differences found with regard to the four nursing modes. Critical issues of instrument reliability and validity were not addressed, and the neutral attitude of the physicians was too readily interpreted as favoring primary nursing.

Multiple outcome studies

Apart from studies which focused solely on perceptions as outcomes of primary nursing care, there were a number of studies which included examination of other outcomes, most often cost and quality of care. Brief mention should be made of the article by Durham (1978), presenting a multiple time series experimental research design for studying the effects of primary nursing on cost, quality, nurse satisfaction, and patient satisfaction. No data or findings were presented; the research was apparently in progress at the time the article was written. The strengths of the proposed design were the use of two comparable hospitals and comparable units within hospitals, the selection of standardized instruments for which some reliability and validity information is available, and the attempt to employ a true experimental design in assessing the outcomes of primary nursing.

Collins (1975) reported a study in which the same dependent variables, i.e., quality of care, staffing costs, job satisfaction, and patient satisfaction, were measured and compared for a primary unit and a team unit in each of two hospitals. It was hypothesized that quality, job satisfaction, and patient satisfaction would be higher and costs would be the same under primary nursing. Collins defined primary nursing by means of Ciske's concepts (1974a), and emphasized the nurse's accountability, autonomy, and responsibility for the care of five to six patients throughout their hospitalization.

Several instruments were used to test the study hypothesis. Quality of care was assessed with an audit instrument containing items from three standardized instruments -- The Quality Patient Care Scale (Wandelt and Ager 1970), the Nursing Care Quality Evaluation used in the V.A. Hospital System (reference not given), and the Medicus audit (Medicus Systems Corporation 1975). Previous findings regarding the reliability and validity of the Quality Patient Care Scale and the Medicus instrument were presented, although none were given for Collins's composite instrument. Interrater reliability coefficients of .77 to .93 were reported for this study, which examined 240 patient records from each hospital, selected randomly over a three-month period. Also, patients and nurses were observed as part of the quality-of-care audit.

The costs of the two organizational modes were assessed by comparing data on salary and staffing costs for the four study units. Job satisfaction of registered nurses and licensed practical nurses was measured by means of a self-administered questionnaire, based on an instrument devised by Dyer (1967) and administered as a pre- and posttest, with retest reliability coefficients of .78 to .90. Validity tests were not performed. All registered nurses and licensed practical nurses on the study units were asked to participate in the satisfaction survey; a total of 83 questionnaires was completed. Satisfaction levels of 292 patients discharged from the study units and meeting several eligibility criteria were evaluated by means of a telephone interview schedule developed by Pasanen and Houston (1971). The reliability and validity of this instrument were not discussed. Quality and patient satisfaction data were analyzed using a chi-square test to determine statistical significance; job satisfaction data were examined by means of a one-tailed t-test.

Collins reported that her first hypothesis of higher quality of care under primary than under team nursing was supported for 12 of 30 variables, where quality was found to be higher for the primary units combined than for for the team units combined. The second hypothesis, that there would be no difference in costs between primary and team units, was supported in only one study hospital. The third hypothesis of higher job satisfaction under primary nursing was also supported in only one hospital, where a significant difference was found for one of five variables, but when scores for both hospitals were combined, the hypothesis was not supported. Finally, Collins claimed that the fourth hypothesis of higher patient satisfaction under primary nursing was supported, although no differences in actual patient satisfaction scores were obtained. Primary nursing patients were found to be significantly more willing to return to the respective hospital than were team patients.

Although conclusions were not stated explicitly, the investigator summarized her findings by saying that primary nursing had significantly improved the quality of care as compared to team nursing, cost differences between the two modes were negligible, and findings concerning job and patient satisfaction were inconclusive.

A noteworthy aspect of this study was the investigator's attempt to compare two different types of primary nursing as determined by the nurses' educational levels. In one study hospital, baccalaureate degree nurses functioned as primary nurses with associate degree graduates as associate nurses. In the other hospital, associate degree graduates were the primary nurses and licensed practical nurses functioned as their associate nurses. These very differences, however, mitigate against the combination of primary units for purposes of analysis, and there were insufficient background data for an assessment of the comparability of the study units, staff members, or patients.

Another limitation to the study was its failure to address fully the issues of reliability and, especially, validity of the instruments. More importantly, the decisions about whether the data supported the hypotheses appear somewhat arbitrary. For example, one study hypothesis had postulated an increase in satisfaction among patients discharged from the primary units over those discharged from the team units. No differences were found in satisfaction between groups, but the hypothesis was nevertheless said to be supported because primary patients were more willing to return to the hospital than were team patients. These factors, and the lack of clarity in describing the process and outcomes of the research, detract from what was otherwise an interesting study.

Similar variables were reported by Marram et al. (1975, 1976) and by Marram (1976) at New England Deaconess Hospital, Boston. The major study question was whether primary nursing is more cost effective than team nursing. Cost effectiveness was defined as the extent to which a unit can produce outcomes of the same quality at less cost, or higher quality outcomes at the same cost and with the same efficiency. For purposes of the study, cost effectiveness was broken down into four dependent variables, i.e., nurse satisfaction with work, quality of nursing records, patient satisfaction with care, and cost of care. The study was set on one team and one primary unit matched for patient and staff characteristics. The investigators provided a full definition of both team and primary nursing, in which the outstanding feature of primary nursing was considered to lie in a distribution of nursing functions so that the total care of each patient is the responsibility of one nurse.

All instruments used in the study appear to have been designed by the investigators. A self-administered questionnaire measured nurse satisfaction with work organization, perceptions of 62 key nursing functions, time spent on specific professional and technical tasks, and involvement with patients. A total of 38 personnel, comprising all nursing staff members on each unit except head nurses and assistant head nurses, participated in the study. The quality of nursing records was evaluated with an instrument corresponding in format to the nursing assessments and Kardex care plans used on the units. Thirty-six patient records from each unit were randomly selected for evaluation. Patient satisfaction was measured with a self-administered questionnaire inquiring into perceptions of personalized care, satisfaction with care, and best and worst aspects of care. All patients who were on the study units on six randomly selected days, who had been hospitalized for at least 24 hours, and who were well enough to respond to the questionnaire were included in the sample, for a total of 59 primary and 49 team patients. The nursing director also completed a questionnaire to identify the costs of operating the two units for a six-month period. No mention was made of the reliability or validity of any of the study instruments. The results were analyzed in terms of percentages, with $p \leq .1$ as the required level of statistical significance for percentage differences.

The findings were clearly supportive of the primary nursing mode. Primary nursing staff were more satisfied than team nursing staff with the organization of their work and had a more professional orientation. They also reported more involvement with patients and perceived the provision of emotional support, together with patient observation and assessment, as important functions more often than the team staff. The units were also different in the quality of patient records, with the primary unit evidently doing more individualized and systematic assessment and care planning. Primary patients were significantly more satisfied with their nursing care and, compared to team patients, more often reported individualized care. The primary unit was found to be less costly in terms of salary budget projections, actual salary costs, and operating and salary costs combined, although operating costs were lower on the team unit. The primary unit was also considered to be more economical in terms of nursing hours, in extra hours charged to the budget, and in actual cost per bed.

Based on these findings, Marram et al. concluded that the primary unit was more cost effective than the team unit. The chief problem with this conclusion in this study, as with other studies reviewed thus far, is the investigators' failure to deal with the issues of instrument reliability and validity. Furthermore, the findings concerning costs of operating the two units are obscured by differences in staff seniority, which was addressed inadequately by the investigators.

Giovannetti (1980) examined the effect of organizational mode in a Baltimore teaching hospital. In this 1976 study, six dependent variables were examined, i.e., amount of direct nursing care received by patients, nature and amount of time devoted to indirect nursing care, nursing staff member job satisfaction, patient satisfaction, quality of nursing care, and cost of nursing care. An adult surgical team nursing unit was compared with another adult surgical unit which had been practicing primary nursing for a year. Although the development of operational descriptions of these two units in terms of their organization and delivery systems was mentioned, these are not included in the report.

A variety of data collection methods were used. The amount of direct care provided was measured by continuous observation of 591 patients, selected by a stratified random sampling technique on all three shifts over the seven-week study period. To measure the amount and nature of indirect nursing care, work sampling techniques were used to record the activities of all nursing staff on the two study units for a total of 76 day, evening, and night shifts. Job satisfaction was assessed with two self-administered questionnaires: a 40-item instrument developed by the investigator, and the Job Descriptive Index (Smith, Kendall, and Hulin 1969), an instrument with acceptable levels of validity. Statistically significant intercorrelations between these two instruments provided evidence of content and concurrent validity. Over 85 percent of the personnel on each unit responded to the job satisfaction questionnaires. Patient satisfaction was assessed by means of a 24-item instrument developed by the investigator, and which covered the expressive, communicative, and professional aspects of nursing care. Quality of care was measured by means of two process audits, i.e., the concurrent nursing care review used routinely throughout the hospital's surgical service and the instrument developed by Collins (1975). The reliability and validity of the patient satisfaction and quality of care instruments were not discussed. Costs of nursing care were assessed by examining actual salary costs per patient day, standardized salary costs per patient day, and regular and overtime hours worked by the nursing staff during the study period. In addition to the data related to the dependent variables, patient classification data were also collected on the two study units.

Analysis of the study data using Tukey's (1977) Exploratory Data Analysis techniques and chi-square and t-tests revealed that on the day shift, the team unit provided significantly more direct care than the primary unit to patients requiring above average care and to all patients combined. No differences were found between units for the evening and night shifts. Indirect care work sampling measurements also showed that the team unit spent more time performing direct care functions than the primary unit on all three shifts. Job satisfaction as well was higher on the team unit; scores on the 40-item instrument developed by the investigator were significantly higher for all staff on the team unit with the exception of the head nurse, and overall scores on the Job Descriptive Index were higher as well. Few statistically significant differences were found between units in patient satisfaction. Although the team patients appeared to be slightly more satisfied with their overall care than the primary patients, satisfaction on both units was quite high. No differences between the two units in overall quality-of-care scores were found, although some were found for specific items of the audit. Standard costs per bed per day were found to be lower on the team unit than on the primary unit ($27.07 and $29.09, respectively).

Giovannetti concluded that these findings favoring team over primary nursing could not be generalized beyond the two study units, due to the absence of an experimental design and to variations in implementation of the organizational modes from the formal definitions in the literature. She suggested further comparisons of the modes in a variety of settings. In spite of these acknowledged limitations of her study, its results are noteworthy in that, unlike the majority of the research in this area, team nursing was preferred to primary nursing on a number of variables. Also, unlike most other research in this area, this study measured what nurses on a primary nursing unit actually did throughout each shift by continuous observation of direct nursing care.

A replication and verification of Giovannetti's 1976 study was reported by Young, Giovannetti, and Lewison (1980). The same units as those compared in the original study were examined three years later, using essentially the same research methods. In the replication, however, patient satisfaction and cost of nursing care were not considered as dependent variables, and only one quality instrument, the hospital's concurrent audit, was applied to the study units. Data were collected on the day and evening shifts only.

In this replication, few differences were found between units in the amount of direct patient care provided by nursing staff. The only significant difference was on the evening shift, where professional nursing personnel on the primary unit provided significantly more direct care to all patients combined than was provided by the same category of personnel on the team unit. No differences were found between units in direct care provided on the day shift. A few significant differences were found in the sampling study of nursing personnel activities. The primary nursing staff was found to spend more time in activities associated with direct patient care and less time in indirect care activities on both the day and evening shifts. Also, on the evening shift, staff on the primary unit spent significantly more time in personal activities than did the team staff.

The primary nursing staff expressed significantly higher levels of satisfaction on the 40-item questionnaire than the team nurses, but no significant differences were found in scores for the Job Descriptive Index (JDI; Smith, Kendall, and Hulin 1969). A comparison of the two job satisfaction scales using intercorrelational analysis revealed that the 40-item job satisfaction questionnaire did not correlate significantly with the JDI. Intercorrelation coefficients between the subscores and total scores of the JDI were significant, however, providing evidence for content and concurrent validity of that scale. It should be noted that the significance of the team unit's higher JDI total score in 1976 was incorrectly reported in the original article by Giovannetti (1980). In fact, on reanalysis, the original scores on the team unit, while higher than those on the primary unit, were not different by a statistically significant margin. Finally, the overall quality audit score in the replication was significantly higher on the primary unit than on the team unit, as were scores on three of the four subscales. The investigators seriously questioned the validity of the quality audit, however.

The investigators concluded that the results of the replication, while not as dramatic as those of the original study, again failed to indicate conclusively that the primary nursing unit had more favorable outcomes than the team unit. It was felt that, taken together, the findings of the 1976 study and the replication gave little support to the change to primary nursing.

Corpuz (1977) reported briefly on a study of the impact of primary nursing on patient perceptions, quality of care, continuity of care, and cost. This study, a series of four separate substudies, was conducted on a number of primary, team, and "modular" units at Evanston Hospital, Evanston, Illinois. Modular nursing was defined as a system of nursing care in which a registered nurse and nursing assistant work together to provide care for a group of eight to ten patients. Primary nursing was described as a system in which the professional nurse is accountable for the care of a group of patients throughout their hospitalization. Continuity of care 24 hours a day, seven days a week, is ensured by assigning to another registered nurse responsibility for the patient when the primary nurse is absent.

Patient perceptions and levels of satisfaction with care were measured in this study with a self-administered questionnaire before and three months after the introduction of primary nursing on one unit. Continuity of care was assessed from the viewpoint of the patient, the professional nurse, and the observer; no description of the instrument used for this purpose was given. Quality of care was evaluated on four units as part of a research effort by the Medicus Systems Corporation. In addition, cost data were evaluated for a number of units over a three-year period. The reliability and validity of the instruments used in these studies were not discussed, nor were specifics of the data analysis given, other than that an unspecified correlation was used for analysis of the quality-of-care data.

Findings were clearly favorable to primary nursing. Primary nursing patients felt that they had a particular nurse with whom they could communicate openly and were better able to express the results of patient education under primary nursing. Greater continuity of care and higher quality of care were found for primary than for team or modular patients, and primary nursing costs to the hospital were no higher than team nursing costs.

Corpuz concluded that the model of primary nursing at Evanston Hospital was the most appropriate approach to meeting the needs and expectations of consumers and nursing personnel. These conclusions are weakened, however, by the lack of information provided in this report, particularly on instrument reliability and validity, patient characteristics, and sampling methods.

Jones (1975) considered negative patient behavior, length of stay, cost of hospitalization to the patient, and number of postsurgical complications as dependent variables in addition to patient attitudes. In this study, data were collected on renal transplant patients randomly allocated to either a primary nursing unit or a team nursing unit at the University of Michigan Medical Center, Ann Arbor. Primary nursing was defined as a method of providing individualized, comprehensive patient care in which each patient is assigned to one nurse who takes responsibility for planning and giving care on a 24-hour basis throughout the hospital stay. The study population consisted of 9 patients in the primary nursing group and 10 patients in the team control group.

Two instruments of unspecified reliability and validity were used to test the hypothesis that outcomes on the five dependent variables would favor primary nursing. A behavior rating scale, which described different aspects of negative behavior, was applied to each study patient on each shift for three weeks after surgery, and a 19-item questionnaire eliciting patient perceptions of the unit, hospital, and nursing staff was answered by all study subjects at the end of the three-week observation period. Data on other study variables were collected from patient records. Unspecified significance tests and correlation techniques were used in analysis of the data.

Major findings reported were as follows: the primary patient group manifested less negative behavior than the team patient group (this difference was not statistically significant); the primary group had significantly shorter hospital stays than the team group and consequently less costly hospitalizations; the primary group had significantly fewer postsurgical complications than the team group; there was no appreciable difference in attitudes between the two patient groups, all patients reporting positive reactions to the unit, hospital, and nursing staff; and a positive correlation existed between length of stay and negative behavior and between length of stay and number of complications. On the basis of these findings, Jones concluded that patients respond to major surgical intervention more quickly and with fewer problems when one nurse is responsible for their care throughout their hospital stay. The study findings were also interpreted as evidence that nurses can be instrumental in reducing the cost of the stay to the patient by contributing to early recovery and discharge.

This study is of particular interest because it is the only primary nursing study reported to date in which patients were randomly allocated to study units. As in most of the other studies reviewed, however, the study design was not truly experimental since staff members were not randomly allocated as well. Other limitations include the small sample size, lack of data on characteristics of nurses, physicians, or patient units, and failure to test the reliability and validity of the instruments and to define the team nursing mode.

A study reported by Kent (1977) and sponsored by the Western Interstate Commission for Higher Education was conducted in six hospitals in the western United States. It examined the differential effect on staff satisfaction and quality of care of three organizational modes -- team, primary, and case method nursing. The investigators hypothesized that the professional staff on primary units would demonstrate significantly higher quality in the nursing process and express a significantly higher level of job satisfaction than staff on team and case method units. Primary nursing was defined as a care delivery system in which a single nurse takes individual responsibility and accountability for all aspects of the nursing care of a selected number of patients from their admission through discharge. Team nursing was defined as a system in which a number of staff share responsibility for planning and providing care for a group of patients for the duration of a shift, with authority and accountability held by the team leader through the head nurse. Case method nursing was defined as a delivery system in which each nurse is responsible for planning and giving care for a group of patients for the duration of the shift. In this system, the nurse is accountable only for the care given during that shift; the head nurse has 24-hour responsibility and accountability for care.

To test their hypotheses, the investigators compared twelve primary units at six hospitals, five team units at two hospitals, and three case method units at one hospital. All units were adult medical-surgical units meeting certain staffing and other criteria established by the investigators and were selected on the basis of their availability in the six hospitals participating in the research project. Patients were selected randomly from two care categories of the patient classification system. A total of 204 patients were included in the study (119 on primary, 50 on team, and 35 on case method units). All registered nurses who had worked on the study units for at least six months were asked to participate. A total of 215 registered nurses took part in the data collection (125 from primary units, 62 from team units, and 28 from case method units).

Quality of care was measured by the instrument developed by Collins (1975) and based on items from three other standardized quality intruments. The investigators examined the acceptable level of interrater reliability in Collins's study and remeasured interrater reliability in their own study, obtaining a minimum agreement level of .80. Since the investigators felt that existing job satisfaction instruments did not tap differences in organizational modes, they developed their own instrument on the basis of previously established items. Pretesting indicated that the new instrument was sensitive to the independent variables; and analysis for reliability and validity yielded high interitem correlations, indicating construct validity. The final job satisfaction instrument consisted of 48 items representing eight subscales. In addition to quality of care and job satisfaction, data (not reported here) were also collected on staffing characteristics, nurse characteristics, support services and patient classification.

Quality and job satisfaction data were analyzed by one-way analysis of variance and t-tests, and partly supported the study hypotheses. On quality-of-care evaluation, the primary units scored significantly higher than the team units, and the case method units scored higher than the primary units, although the latter difference was not statistically significant. The same trend was found for the job satisfaction measurements, where the primary units scored significantly higher than the team units, and the case method units significantly higher than the primary units.

Kent discussed the possibility that the findings reached by the investigators in the study were based more on differences in individual care settings than on the modalities under study. The investigators believed, however, that despite the uneven distribution of modalities, there had been sufficient control on the variables to ensure the validity of the findings. The investigators therefore concluded that primary nursing appears to result in significantly higher quality of patient care and staff satisfaction than team nursing. Since all of the data for the case mode were obtained in one hospital, where the mean scores on both dependent variables were higher for primary than for case method nursing, the investigators were unwilling to generalize the case method findings to the broader population or to draw conclusions from them. Kent recommended carefully controlled intrahospital and interhospital comparisons and before-and-after studies.

As part of a longitudinal study of nurse job satisfaction and turnover in two university medical centers, Alexander, Weisman, and Chase (1980) compared primary nursing and other types of units with respect to structural attributes of the units, nurse perceptions of their units and jobs, satisfaction, absenteeism, and turnover. In this study, registered nurses from 31 primary units were compared with those from 20 other units. In both study hospitals, primary nursing was based on the model described in the literature by Marram, Schlegel, and Bevis (1974). Other units were defined as those using either functional or team nursing. All units in both hospitals which had been using the same method for at least six months were included in the study sample.

Data were obtained from several sources. Nurses employed throughout the six-month study period were interviewed at the end of this period, for a total of 98 percent of 512 staff nurses on the study units. They were queried about their perceptions of the head nurse, autonomy, repetitiveness in their work, and other aspects of their jobs. Job satisfaction was measured by the Job

Descriptive Index (Smith, Kendall, and Hulin 1969) and items from Brayfield and Rothe's (1951) work satisfaction scale. The high internal consistency found for two of the subscales included in the interview was discussed in the report. Hospital records were used to obtain information on unit characteristics, absenteeism, and turnover. Nurse turnover was also monitored for an additional six months after the data collection period. Data analysis employed t-tests and Mann-Whitney U-tests.

Comparison of structural attributes of the primary and nonprimary units yielded only one statistically significant difference, i.e., the greater number of full-time registered nurses employed on primary units in one of the two study hospitals. The investigators attributed this to the organizational restructuring of the primary units. Comparison of unit types with respect to nurse perceptions of their units and jobs again revealed only one statistically significant difference, in that nurses on other than primary units reported more often that they had too little contact with patients and had to perform tasks which they considered inappropriate. Conversely, a greater proportion of primary nurses in one study hospital said that they had less contact with their head nurses and participated in decisions on patient care with the physicians. The investigators considered these findings consistent with the primary nursing literature, which stresses the responsibility and authority assumed by the staff nurse on the primary nursing unit.

No significant differences were found in job satisfaction between the two types of units, a result considered surprising by the investigators in light of the claims in the nursing literature on the effect of primary nursing on increased satisfaction. Significantly lower turnover and absenteeism rates on primary nursing units were found in only one of the study hospitals. The investigators felt that these mixed results indicated varying degrees of support for the primary nursing mode as an effective organizational policy. Among several explanations suggested for their findings, they pointed out that the organizational mode of nursing may not be a sufficiently salient job component to have a direct impact on nurse satisfaction. Second, they acknowledged that the impact of an organizational change such as the implementation of primary nursing is difficult to measure, evaluate, and control. They said that comparison of a number of primary and other units in two hospitals may have increased the possibility that variations in they way in which the mode was practiced obscured measurable differences between the two types of units.

The investigators recommended that future studies of primary nursing develop objective criteria for determining the degree of implementation of the organizational mode and that finer distinctions be made between purely primary units and primary units using elements of other modes. They concluded that more attention must be paid to the conceptualization and measurement of primary nursing before the respective costs and benefits of the various modes can be determined.

Butts (1976) conducted an in-depth study of the entire experience of the hospital patient, one facet of which was a comparison of the effectiveness of team and primary nursing. It was hypothesized that a change in the care delivery system from team to primary nursing would have an impact upon the patient. Due to delays in analysis encountered by the investigator, the presentation of findings was incomplete.

A before-and-after research design was used. Two 30-bed medical units organized under the team nursing mode were studied for six months and for another six months after primary nursing had been introduced on the experimental unit. A large number of dependent variables was defined and grouped under 23 headings, including patient activity, sleep, communication, and information seeking patterns; moods; and levels of passivity or activity. Data on these variables were collected by means of a "specimen record methodology" devised by Barker (1963) and Wright (1967), in which observers wearing microphones described all behavior, contacts, and conversations of study patients, who also wore microphones. Careful attention was paid to both interobserver and intercoder reliability. A total of 12 team patients and 12 primary patients were randomly selected for observation, and each was observed either for the entire hospital stay or at least five 24-hour periods.

Other study variables included primary nurse opinions of the new organizational mode, obtained with self-administered questionnaires; patient perceptions of care, obtained by means of interviews after discharge; and nurse social interaction, assessed with the Schlotfeldt-Methven Social Interaction Inventory (Methven and Schlotfeldt 1962). Data on patient characteristics such as age, sex, race, socioeconomic status, and diagnosis were also collected. The reliability and validity of study instruments were not mentioned.

On the basis of the large quantity of data obtained, analysis of which was not complete at the time he wrote his report, Butts found that nurses experienced greater personal satisfaction under primary than team nursing. The nurses in the study also believed that primary nursing was superior to team nursing. Butts found, however, that introduction of primary nursing did not result in individual registered nurses spending more time with a specific patient than under team nursing, indicating that primary nursing did not improve the continuity of nursing care. Primary patients were found to be more active in their relationships and less negative in their moods than team patients. Butts also reported preliminary indications that quality of care may have been superior under primary nursing, but analysis of this component of the study was not complete.

Carey (1979) examined the effect of primary nursing on a variety of perceptual and other dependent variables as part of a study comparing a traditional team unit at Lutheran General Hospital, Park Ridge, Illinois, with a personalized patient care (PPC) unit.

PPC was defined as an organizational mode with three essential components, i.e., primary nursing care, physical decentralization of the unit with elimination of the nursing station, and unit management. The primary nursing component of PPC was not defined.

To examine the effect of unit type on, among other variables, patient satisfaction, knowledge, and perception of the relief obtained from their medical problems, 86 PPC patients and 99 team patients were randomly selected for interview on their day of discharge. Follow-up interviews by telephone were conducted with the same patient sample four months after discharge. Six nurses and nine physicians were also randomly selected for an interview about their perceptions of PPC. The reliability and validity of the interview schedules used were not mentioned. A test of proportions was used in analysis of the data.

Analysis of the discharge interviews yielded somewhat contradictory results regarding the beneficial effects of PPC. Significantly more PPC patients than team patients were able to name their medications. They were more satisfied with the information given them and had more confidence in their physicians and nurses and in their own ability to help themselves, although these differences were not statistically significant. On the other hand, team patients had more knowledge about their medical problems and food and activity regimens, and a greater number of team than PPC patients reported that they had obtained complete relief from their medical problems. Also, the investigators found that PPC patients were not discharged sooner than team patients.

Results from the follow-up interviews with patients were somewhat less ambiguous with regard to PPC. More PPC patients than team patients said that the plans they had received from physicians were clear and that they had obtained complete relief from their symptoms. Fewer PPC patients than team patients said they returned for three or more visits with their physicians. More PPC patients than team patients said they were pleased with the hospital and their medical care. Staff data were inconclusive. No differences in attitudes were found between the two groups of nursing personnel surveyed, while two of the nine physicians interviewed expressed negative attitudes toward PPC.

Carey concluded that PPC did not have a clearly discernible effect on either patient attitudes and behavior or on nurse and physician opinions. He tentatively attributed this to the very high level of care provided on the team unit, to the low power of the test used to examine statistical differences, and to the difficulty in finding measures sensitive to the salutary effects of new programs. Within the context of these observations, Carey felt that "considered on a goal-by-goal basis, the significant effects of PPC on patient knowledge, attitudes and behaviors were few" (p. 1255). This conclusion is of limited relevance to the question of the benefits of primary nursing, as this mode was only one of three essential components of PPC. It was not possible in this study, therefore, to distinguish the effects of primary nursing from those of unit decentralization and unit management. The relation of these findings to primary nursing issues was further obscured by Carey's failure to define primary nursing in his hospital and by his generally sketchy description of the process of his research.

Hegedus (1979) at Beth Israel Hospital, Boston, focused on whether primary nursing can reduce the occurrence of events that place high stress on hospital patients. To answer this research question, a pretest-posttest control group design (Campbell and Stanley 1963), without randomization of patients or staff, was used. Patients were tested on four functional nursing units and again six months after implementation of primary nursing on two of the units, which were used as experimental units; the same instrument was used on all four units both pre- and posttest. Twenty patients from each unit were selected by their head nurses at both testing stages (Time 1 and Time 2), for a total of 160 patients. Primary nursing was defined in this context as a system of care in which the nurse is accountable for the care of her assigned patients from admission through discharge.

The instrument used to evaluate stress was developed by Volicer (1973) and based on an instrument developed earlier by Holmes and Rahe (1967). Patients were given 49 cards listing stressful events which might occur in the hospital and were asked to divide them into events which happened and events which did not happen. The rank of all events selected as "happened" was used to obtain a stress score for each patient. No mention of the reliability and validity of the instrument was made in the report, although references to Volicer's work were cited. An unspecified significance test was used to compare means.

All findings were positive with regard to primary nursing. Differences in stress levels between experimental and control groups were not significant before primary nursing was implemented, but were significant after implementation on two of the units. No significant difference in control group scores was found between Time 1 and Time 2, while a significant difference between experimental group scores was found before and after implementation of primary nursing.

Hegedus concluded that primary nursing patients experienced fewer of the stresses typically related to hospitalization than functional nursing patients. However, this study, too, was limited by the head nurses' selection of patients for participation, and the report lacked an explicit discussion of instrument reliability and validity.

A second research report by Hegedus (1980) focused on quality of care, quality of care plans, and nurse job satisfaction levels. Data collection procedures were the same as those reported earlier by Hegedus (1979) with the exception of the job satisfaction data, which were collected only once, i.e., six months after primary nursing was introduced. Measurements on two primary units and two team/functional units were reported. Primary nursing was again described as a system in which the primary nurse is responsible and accountable for the total care of a patient over a 24-hour period, from admission through discharge, but although a brief definition of functional nursing as care delivery by assigned tasks was given, team and team/functional nursing were not defined.

Quality of care was measured with the Quality Patient Care Scale (Wandelt and Ager 1970). Care plans were assessed with a concurrent chart audit devised by the hospital, and job satisfaction was measured with a 40-item instrument based on the theory of work satisfiers and dissatisfiers (Herzberg, Mauser, and Snyderman 1959). Satisfactory reliability coefficients were reported for each instrument, and validity of the instruments was discussed. Fifteen percent of the patient population on each unit was randomly selected from a pool of patients meeting eligibility criteria for the Quality Patient Care Scale evaluation, 25 percent of patient records on each unit were randomly selected for the chart audit, and 40 nurses completed the job satisfaction questionnaire. Sampling techniques used for this last group were not specified. Data were analyzed with t-tests, analysis of variance, and percentage comparisons.

Findings with regard to quality, care plans, and job satisfaction were generally supportive of primary nursing. A significant increase on the quality measure was found on the experimental units between Time 1 and Time 2, while the audit revealed no corresponding change on any unit with respect to presence of a nursing assessment or formulation of nursing diagnoses or orders. The only noticeable change in care planning was in the area of documentation, with a 5 percent increase on the control units and a 16 percent increase on the experimental units at Time 2. No differences were found in the motivation measures of the job satisfaction instrument, but nurses on the primary units scored higher on hygiene measures and were judged to be more satisfied. Hegedus said that the findings supported the administrative decision to implement primary nursing throughout the study hospital. She concluded that primary nursing facilitates professional nursing practice, as shown by patient and nurse responses in the study.

Quality of care

Three studies reported in the nursing literature focused chiefly on quality of care under primary nursing. One, reported in a series of articles by Felton (1975b), Felton et al. (1976), Williams (1975), and Frevert and Galligan (1975), compared the quality of care on an experimental primary unit and a control team/functional unit at Children's Hospital National Medical Center, Washington, D.C. Organizational modes were defined clearly in these reports; primary nursing was described with reference to three basic concepts: (1) responsibility for care throughout the patient's hospital stay; (2) 24-hour responsibility for planning, providing, and evaluating care; and (3) ordering of information processes, including discharge planning.

One study hypothesis was that the mean scores on three standardized instruments, the Quality Patient Care Scale (Wandelt and Ager 1970), the Slater Nursing Competencies Scale (Slater 1967), and the Phaneuf Nursing Audit (Phaneuf 1972), would be higher on the primary than on the team/functional unit. The investigators also postulated that as the nurses progressed from staff nurse to senior staff nurse to primary nurse to clinical coordinator, their mean scores on the Slater Scale would increase.

The Slater Scale was used to evaluate the interactions of specific nurses with their patients; the Quality Patient Care Scale to evaluate the care received by specific patients, and the Phaneuf Audit to measure quality of nursing care received by patients as reflected in complete records at the end of the cycle of care. Acceptable reliability and validity coefficients obtained in previous studies for the Slater and Wandelt and Ager instruments were reported. Interrater reliability coefficients of .74 to .98 for the two instruments were also given. The need to subject the Phaneuf Audit to tests of reliability and validity, and to assess the construct validity of all three instruments, was recognized by the investigators.

The Slater Scale was applied to the 11 professional nurses on the experimental unit and the 7 professional nurses on the control unit. The Quality Patient Care Scale and Phaneuf Audit were applied to 30 patients and their records, randomly selected from all patients on the study units who met several criteria for inclusion. In addition to quality data, the cost of care and the number of nursing hours spent in care were also examined.

Both study hypotheses were supported. Mean scores on all three instruments were higher for the primary than for the team/functional unit. A one-tailed t-test showed the difference between units to be statistically significant for the Quality Patient Care Scale and Phaneuf scores. Means scores on the Slater Scale, not subjected to the t-test, rose as the nurses' employment levels rose. In addition, the costs of nursing care per patient per day were found to be lower for the primary than for the team/functional unit. The total number of hours of professional nursing care was greater on the experimental unit, although the control unit provided a greater number of hours of care, both professional and nonprofessional, per patient per day. The investigators considered this difference due to differences in patient census between the two units.

Based on their findings, the investigators concluded that "the organization of the experimental unit and the range of nursing competencies added up to increased quality of nursing care as measured by the criterion variables" (Williams 1975, p. 39). The validity of this conclusion is strengthened by the status of the principal investigator (Felton) as an outside researcher with no vested interest in primary nursing or the study hospital, and by the careful consideration of the reliability and validity of the three standardized instruments selected for use in the study.

In a later study set at the same hospital, Eichhorn and Frevert (1979) compared the quality of care on four units before and after the implementation of primary nursing. Primary nursing at Children's Hospital was described as the assignment of six to eight patients to one primary nurse who is held accountable 24 hours a day for planning, implementing, coordinating, and evaluating care from admission to discharge. Primary nurses at Children's Hospital have flexible schedules and can adjust their hours to meet the changing needs of their patients. Since the investigators failed to state in their article what organizational mode was practiced on the study units before primary nursing was implemented, one can only assume that it was the team/functional mode described in the earlier studies by Felton et al.

Eichhorn and Frevert hypothesized that the introduction of primary nursing would improve the quality of nursing care provided on the study units. To test this hypothesis, 34 Quality Patient Care Scale (Wandelt and Ager 1973) scores were obtained before implementation and compared to 32 scores obtained after implementation. Sampling techniques for the selection of patients whose care would be evaluated were not specified. In their bibliography, the investigators provided a reference to the evaluation scale, pointing out that it had been previously tested for reliability and validity. The level of interrater reliability achieved among their observers was likewise discussed; correlation coefficients ranged from .60 to .96.

Analysis of Quality Patient Care Scale scores using Student's t-test indicated that total scores had increased markedly after the implementation of primary nursing. Statistically significant increases in scores were found for both medical and burn patients; an increase found for surgical patients was not significant. A breakdown of scores by subsections of the scale revealed significant post-implementation increases on the sections dealing with individual psychosocial care, general care, communication, and professional implications. Slight, statistically insignificant post-implementation increases were found for the group psychosocial and physical care subsections. On the basis of these findings, Eichhorn and Frevert concluded that introduction of primary nursing had led to considerable improvement in the quality of nursing care at Children's Hospital.

The third study of primary nursing which focused chiefly on quality of care was conducted by Steckel, Barnfather, and Owens (1980) on six units at St. Joseph Mercy Hospital, Pontiac, Michigan, over a 13-week period. The study attempted to measure both process and outcomes of nursing care in addition to patient and nurse satisfaction. The Quality Patient Care Scale (Wandelt and Ager 1970) was administered to patients during their hospitalization. These patients were then followed until discharge and evaluated with the Horn-Swain Health Status Dimension Scale (Horn and Swain 1978), which assesses whether patient requirements for air, water, food, and rest-activity-sleep have been met. Data were also collected on nurse satisfaction, turnover, absenteeism, and tardiness, and on patient length of stay, number of complications related to nursing care, and level of patient satisfaction. The reliability and validity of the instruments were not discussed, although the investigators did say that the satisfaction instruments were not sensitive and generally inadequate. The study sample consisted of 132 patients and 131 nurses representing two primary units, one total patient care unit, and three team units; neither mode was defined. Both groups were selected with a stratified random sampling technique.

Results of the measurements partly supported primary nursing, in that scores on the Quality Patient Care Scale were significantly higher for primary and total patient care units than for team units. On the Horn-Swain instrument measures the only statistically significant difference between units concerned the chest expansion variable, for which primary patients demonstrated more favorable outcomes at time of discharge than other patients. No significant differences were found in absenteeism, turnover, patient satisfaction, or nurse satisfaction across units.

It was concluded that the individualized patient care embodied in primary nursing, involving a high degree of continuity of care between nurse and patient and an all-registered nurse staff, resulted in higher quality of nursing care. The investigators stated, however, that it was not clear whether this difference could be attributed solely to the primary nursing mode. These issues were further confused by the failure of the report to define the different nursing modes and to address the reliability and validity of the instruments used.

Last but not least, the study by Haussmann, Hegyvary, and Newman (1976) of correlates of quality of nursing care deserves mention in any review of research on primary nursing. In this carefully designed and executed study, data were collected on six categories of variables relevant to quality of care. Chief among these were unit structural characteristics and type of nursing care organization, the latter identified as functional, team/functional, team, team-primary, and primary modes.

On the basis of extensive data collected in 19 hospitals, the investigators concluded that, of the six categories of variables identified, unit structure and organization (encompassing variables such as size, coordination, staff mix, and organizational mode) had the greatest impact on nursing quality. The highest scoring units tended to be smaller, better coordinated, and with a high proportion of registered nurse hours per patient day; these units also tended to be oriented toward primary nursing.

In summary, the research literature presented mainly positive findings from studies of primary nursing. Improvements in job satisfaction, patient satisfaction, quality of care, and cost-effectiveness were described as outcomes of this organizational mode. Intuitively, such findings seem credible for a mode which, by definition, increases nurse responsibility, autonomy, authority, and the continuity of nurse-patient assignment. Objective measurement of these outcomes by reliable and valid instruments and using appropriate research designs and sampling techniques was largely lacking, however. Statistical analysis of data was also deficient in many cases. Although most investigators set significance levels in statistical tests at $p \leq .05$, some did not state the exact levels used, and a few used $p \leq .1$, a relatively unconservative level. Often, neither primary nursing nor the other modes with which it has been compared were operationally defined. In general, therefore, relatively few of the studies reported in the literature appear to have been methodologically sound, and the generally positive outcomes of primary nursing reported should be considered with some reservation.

SUMMARY AND IMPLICATIONS: PRIMARY NURSING CARE

The literature on primary nursing is extensive. The purely descriptive literature contained almost a hundred articles, chiefly case studies of primary nursing units but also discussions of the philosophy of primary nursing and of other areas of nursing as they relate to this organizational mode. The descriptive-evaluative literature, which in many cases also used the case study approach, included some evaluation results and reported favorable outcomes of primary nursing mainly with respect to patient perceptions, nurse perceptions, cost, and quality. The informality and methodological weakness of these evaluation efforts, however, diminish the significance of their results.

The research literature on primary nursing comprises two separate categories -- exploratory, noncomparative studies, and systematically conducted comparative studies. Organizational mode was the independent variable in most comparative studies and patient and nurse perceptions and levels of satisfaction, quality of care, cost of care, and related factors were the dependent variables. This comparative research, which is probably most relevant to assessment and future studies of primary nursing, is summarized in the following.

The studies by Daeffler (1975, 1977) Hymovich (1977), Kocher (1976), and Marram, Schlegel, and Bevis (1974) found that patients, as well as nurses and other hospital staff, had positive perceptions of primary nursing. These conclusions are not entirely convincing, however, since in these studies research design and methodological issues such as sample selection, instrument reliability and validity, and statistically sound data analysis received insufficient attention. Also, the number of units included in these studies was relatively small for a representative sample: Daeffler compared five team units with one primary unit, Hymovich studied only one unit, Kocher focused on small numbers of patients and staff rather than units, and Marram, Schlegel, and Bevis studied an unspecified number of primary, team, functional, and case method units.

Cassata's (1973) study, which used instruments of undetermined reliability and validity, found both positive and negative results of primary nursing. Although patients on three primary units, as compared to patient on three team units, were found to have better relationships with their nurses, primary nursing staff members were more dissatisfied and frustrated in their work than were team nursing staff members. The study by Mills (1979), on the other hand, employed an experimental design and used instruments of tested reliability and validity. Statistically significant increases were found in perceived autonomy, authority and accountability among nurses after implementation of primary nursing on six units. Positive changes over time were also found on primary units in patient perceptions of individualization, communication, and participation in care. For a number of other study variables concerning both patients and staff, however, no effects of the new mode could be detected.

Studies of perceptions and other outcomes also favored primary nursing. Collins (1975), comparing two primary and two team units with instruments of unknown reliability and validity and a problematic research design, found higher quality under primary than team nursing. Findings concerning job and patient satisfaction were inconclusive. Marram et al. (1975, 1976), also using instruments of untested reliability and validity, found nursing on a primary unit superior to nursing on a team unit with respect to costs, quality of care, nursing staff satisfaction, and patient satisfaction. In contrast, when Giovannetti (1980) examined the same dependent variables, as well as direct nursing care and indirect nursing functions on one team and one primary unit, she found team nursing superior to primary nursing with respect to costs and amount of direct care provided on the day shift, and few statistically significant differences between modes in quality or patient satisfaction. In a replication of this study, Young, Giovanetti, and Lewison (1980) found less favorable results in favor of team nursing, but still no compelling evidence in favor of primary nursing. Corpuz (1977), comparing team, primary, and modular units, found that cost, continuity, quality and patient satisfaction outcomes were more favorable under primary nursing. Jones (1975), comparing small samples of specialized patients on one team unit and one primary unit, found that primary patients had more favorable outcomes in terms of less negative behavior, length of stay, cost of hospitalization, and number of complications. However, this study and most of the other studies reviewed failed to consider important methodological issues, such as instrument reliability and validity and comparability of units with regard to nurse and physician characteristics.

Kent (1977), comparing primary, team, and case method nursing on 20 units in six hospitals, found that primary units scored higher than team units, but lower than case method units, on quality and job satisfaction measures. Evidence of the validity of the job satisfaction instrument used was provided. In another carefully conducted study which was set in two university medical centers, and which used a sound research design and reliable scales, Alexander, Weisman, and Chase (1980) found that resignation and absenteeism rates were lower on 31 primary than on 20 other units in one hospital. Significant differences in job satisfaction between the two types of units, however, were found in neither setting.

In a large study examining the effects of team and primary nursing on 23 dependent variables, Butts (1976) reported preliminary results on two units; nurse satisfaction increased under primary nursing but no improvement was found in continuity of direct nursing care. Butts used standardized instruments and addressed questions of interrater reliability, but not the reliability or validity of instruments. Carey's (1979) comparison of a team nursing unit and one unit with an innovative organizational mode, of which primary nursing was one component, found no clearly visible effect of the new mode on patient attitudes and behaviors or on nurse and physician opinions. Carey as well failed to address issues of instrument reliability and validity.

Studies of the effect of nursing mode on patient stress, conducted by Hegedus (1979, 1980), found that primary nursing on two units, as contrasted with functional nursing on two units, had a beneficial effect on patient stress levels. Hegedus also found improvements in nurse satisfaction and quality of care under primary nursing. Standardized instruments for which some evidence of validity was available were used.

In the research focusing chiefly on quality of care, a careful comparison in the pediatric setting by Felton et al. (1975b, 1976), Williams (1975), and Frevert and Galligan (1975) of the effect of primary nursing on the process of care used three standardized instruments; for two of these evidence of reliability and validity was available. This study, despite the small number of units examined (one primary and one team/functional unit), presented the strongest evidence that primary nursing can improve quality. Eichhorn and Frevert's (1979) follow-up study on four units at the same hospital, using only one standardized instrument, found improvements in quality after the introduction of primary nursing.

Steckel, Barnfather, and Owens (1980) attempted to measure the effect of primary nursing on the process and outcomes of nursing care, as well as on patient and nurse satisfaction. Their measurements, made on two primary and four other units with instruments whose reliability and validity were not mentioned, were only partly in support of primary nursing; quality appeared to improve under primary nursing, while patient and nurse satisfaction levels remained the same. A large, carefully designed and executed quality study by Haussmann, Hegyvary, and Newman (1976) found that units scoring highest on quality measures tended to be oriented toward primary nursing.

In summary, therefore, the literature is generally supportive of primary nursing but lacks overall credibility, practical relevance, and generalizability. Because of the methodological problems referred to (mainly lack of instrument testing for reliability and validity), the findings obtained in studies paying insufficient attention to methods are, if not necessarily false, unverified until they can be confirmed by objective, repeatable measurements. Only a few studies (Felton 1975, Kent 1977, Hegedus 1980, and Haussmann, Hegyvary, and Newman 1976) indicated that primary nursing in some settings can have a measurable positive effect on quality of care. On the other hand, the most rigorous measurement of job satisfaction in the literature, by Alexander, Weisman, and Chase (1980), found job satisfaction the same under primary and under team nursing. Mills's (1979) careful study found increases in perceived autonomy, authority, and accountability of nurses and in perceived individualization of patients, but no difference between modes for a number of other study variables. Also, it is possible, and was occasionally acknowledged, that even those instruments of known reliability and validity were not sensitive to the differences between organizational modes.

Another problem is the failure of the research on primary nursing to address a number of important variables. For example, insufficient attention has been paid to the effect of organizational modes on outcomes of nursing care. Except for the studies by Jones (1975) and Steckel, Barnfather, and Owens (1980), researchers examining the quality of care under primary nursing have focused chiefly on care process and documentation. Also, with the exception of the studies by Butts (1976) and Giovannetti (1980), which used techniques for continuously observing and recording direct nursing care provided throughout each shift, little attention has been paid to what nurses actually do, or to how their activities differ according to the organizational structure of their units. As long as such measures remain undeveloped, comparison of primary and other nursing modes will be of limited practical value.

Furthermore, in both the descriptive-evaluative and research literature, overly generalized conclusions have been drawn on the basis of findings from one or two primary nursing units. In the research literature, only Cassata (1973), Marram, Schlegel, and Bevis (1974), Haussmann, Hegyvary, and Newman (1976), Corpuz (1977), Eichhorn and Frevert (1979), Mills (1979), and, in particular, Alexander, Weisman, and Chase (1980) studied a larger number of primary units. The latter study was conducted on 31 primary and 20 other units and thus provided a considerable range of observation within the overall study setting. Variation in how different units were practicing primary nursing was considered by the investigators as one possible reason for the lack of measurable differences between modes. It should also be noted that many of the studies set on one or two units studied "model" primary units whose operation and outcomes cannot be generalized to the larger universe of established primary nursing units.

This indicates another pervasive problem in the literature. There clearly are many differences in those organizational structures labeled primary nursing, and in the absence of clear and definitive descriptions of this nursing mode, comparisons and generalizations are difficult if not impossible. Although most articles and reports presented definitions of primary nursing, some of them at considerable length, few described how primary nursing was actually practiced, and none provided an operational definition of primary nursing. For example, many authors defined primary nursing in terms of 24-hour responsibility, accountability, and authority, but none proposed how these attributes should be measured or how their presence or absence could be determined. If a nursing unit says that it assigns 24-hour responsibility to the primary nurse, how is one to determine whether and to what extent the nurse actually assumes this responsibility? Until the question of defining primary nursing and other modes in measurable terms is answered, it will be difficult to accept and generalize research findings.

In this connection, the most promising work in the area of defining organizational modes may be that by Munson and Clinton (1979). They have designed, and are continuing to refine, an instrument which characterizes organizational modes (which they call "assignment patterns") in terms of ten basic elements of care grouped under the headings of integration, continuity, and coordination. This instrument appears to be an important step in defining, and distinguishing in measurable terms, different forms of primary nursing and other organizational modes. Munson and Clinton have summarized their experience in a conclusion which has clear implications for the study of primary nursing; they consider it a fallacy to assume that there is one best way to organize nursing personnel and resources, regardless of differences in patient populations. Anderson and Choi (1980) have made this point as well, stating that primary nursing is not for all organizations, particularly those unable to provide the necessary administrative support and autonomy. These considerations clearly apply also to the conclusions in this literature review regarding organizational modes other than primary nursing. Research might be more fruitful if it were focused on identifying the conditions under which specific organizational modes are most effective, rather than on attempting to determine which mode is best. There is no doubt that both operational and environmental factors will affect the kind of organizational structure needed; the fact that a mode appropriate for one care setting may be inappropriate for another must be considered by those involved in nursing research and policy formulation.

The basic premise of all the literature on primary and other nursing modes is that the organizational structure of the nursing unit has a great impact on outcomes such as patient perceptions of care, patient behavior, nurse satisfaction, nurse functions, and quality of care. This may well be true, but factors other than organizational mode may be of no less importance. Alexander, Weisman, and Chase (1980) speculated that organizational modes in their study settings were not sufficiently salient features of the work setting to have a direct impact on nurse satisfaction. This may also have been true in other studies reported in the literature, where the observed outcomes may in fact not have been attributable to primary nursing. Furthermore, so many variables may influence outcomes in the complex setting of the patient care unit that it is almost impossible to isolate a single cause of an outcome or event. The level of job satisfaction on a unit, for example, may be influenced as much or more by the leadership of the head nurse and the cohesiveness of the work group as by the organizational mode. In interpreting the literature on primary nursing, it must be kept in mind that the reported outcomes were produced by a complex interaction of variables, many of which may have remained unidentified.

It is thus clear that further research on primary nursing and other organizational modes must pay careful attention to issues of research design and methodology. Operational definitions of the different organizational modes are needed, and investigators must realize that neither primary nor any other nursing mode is the best and most appropriate one for all settings and patient care situations. Environmental and operational influences on the study variables must be recognized and reported. If these and other steps to improve the quality of research are taken, the effectiveness of primary nursing for specific care settings is more likely to be demonstrated in a convincing manner.

ENVIRONMENTAL FACTORS

The previous chapters in this monograph have considered input and operational factors. Operational factors are, in a sense, largely dynamic and act on input to produce an output. Environmental factors represent relatively fixed parameters and constraints within which nursing must carry out the care process. Although nursing can influence some of these factors to some degree, it is much more likely that the reverse is true; i.e., most of the environmental factors act to govern or control the manner in which nursing care is delivered.

Few of the environmental factors contained in the conceptual framework of Figure 2 have been considered for their effects on nurse staffing, however. Chapter 8 is, therefore, limited to a discussion of those discussed in the existing literature, which includes only relatively technical aspects of the environment, i.e., unit design, the use of computers as it affects nursing schedules, and the unit dose system.

Chapter 8

ENVIRONMENTAL FACTORS

UNIT DESIGN

Among environmental factors claimed to have an effect on nurse staffing is the physical design of the inpatient nursing unit. The traditional unit designs of large wards for charity patients, and long single corridors with many private rooms for more affluent patients who were cared for by their private duty nurses, have been outdated by changes in the philosophy and patterns of patient care and by advancements in medical technology. Over the last twenty years, architects and hospital planners have attempted to create more efficient and effective nursing units. Some of the newer designs include the double corridor, angular, hexagon, radial or circular, and spoke designs, and the compact cluster. Within each of these innovative designs, there are factors which have been considered to have varying effects on nurse staffing, e.g., the total area of the unit, area per bed, number of beds, the ratio of private to multiple-bed rooms, the equipment available, where equipment is placed, the mode of nursing care practiced, and the composition of the patient population.

Among output factors usually considered for evaluation in studies on unit design are the travel distance and travel time required of the nursing personnel; the type, level, and amount of nursing care given; personnel satisfaction and preference; patient welfare and satisfaction; and nurse utilization of units of different designs.

The reviews by Aydelotte (1973) and Jelinek et al. (1976) included lengthy reports on many of the classic studies on unit design. Aydelotte included critiques of six studies, which indicated that nurses' travel time did differ in nursing units of different designs and that more nurse time was available for direct care on circular or radial units than on angular units. Jelinek et al., after reviewing 21 descriptive articles and research reports, concluded that the Friesen, circular, and spoke designs were superior to conventional designs. Furthermore, they recommended that in designing a new facility one should "consider alternatives to traditional nursing unit design, realizing that unit design is related to nursing organization (functional, team or primary)" (p.59). They also recommended that nursing personnel be included in the planning of new facilities.

The following review of the literature on unit design will include much of the work previously discussed by Aydelotte (1973) and

Jelinek et al. (1976), as these studies continue to represent the major effort in this area. Thus, the discussions included here are brief and the reader is referred to the work of both Aydelotte and Jelinek et al. for details omitted from this review.

DESCRIPTIVE LITERATURE

Most of the descriptive articles on unit design were limited in scope and dealt with only one or two facets of the total unit design.

The importance of including nurses when designing hospitals, and the basic knowledge nurses need to function effectively in this planning process, are discussed in numerous articles (Breger 1974; Thier 1976, 1978; Ryan 1975; "Planned from bedside to outside" n.a. 1976; Goldstein 1979; Grubbs and Short 1979; Ravgiala 1979). Several authors advocated the use of mock-up or model units to test the proposed design and to orient the staff to new designs (Dagnone and Dolan 1971; Ryan 1975; "Planned from bedside to outside" n.a. 1976).

Some of the descriptive literature included discussions of the appropriate number of beds for a nursing unit (Pullen 1966), and the number of beds per room. Traska (1977a,b), McLaughlin (1968), and "One patient, one room: Theory and practice" (n.a. 1975) favored single bedrooms; Thompson (1955) favored four-person bedrooms, and Isaacman (1976) preferred one open bed ward as the nursing unit.

Another consideration in selecting a design is the optimum efficiency of the unit, which both Garfield (1971) and Craft and Bobrow (1969) defined in terms of minimizing travel and maximizing patient-nurse visibility. Others felt it is most important to design the unit to meet the requirements of the mode of nursing care to be provided on the particular unit (Dagnone and Dolan 1971; "Hospital built for nurses works well for everyone" n.a. 1970). Isler (1972) related experiences of moving to a new round hospital and the positive effect of the new design on the morale of the staff and the feelings of the patients.

Gordon A. Friesen developed the concept of nursing care named after him which decentralizes storage of supplies, charts, and medications, while retaining a centralized approach to communications, traffic control, reception, and coordination with other areas and personnel in the hospital. Features of this design have been described by Germaine (1970, 1971b), Downs (1971), and in "Designed-in systems help reduce nursing load" (n.a. 1970).

A major feature of the Friesen concept is the nurse server, i.e., a dual-access professional supply cabinet that open onto the hallway and into the patient's room. It contains all linens, supplies, and medications needed for patient care, as well as the patient's chart and care plan. At the bottom of the cabinet is a sealed-off bin for the disposal of soiled linens and waste material which is emptied daily by a materials supply clerk. This clerk also makes rounds several times a day to stock the supplies that will be needed for each patient's care. The system is geared to making all materials for individual patient care immediately available to the nurse so that she can complete treatment, care, and charting without leaving the room.

Three articles evaluating some aspects of nursing innovations mentioned the usefulness of nurse servers. Beath (1971) described the successful use of nurse servers in conjunction with a central communication system and without a central nurses' station as one component of the reorganization of nursing care at Victoria General Hospital in Winnipeg, Canada. Race (1974) described the use of nurse servers placed between patient rooms for charting and medications as part of the total patient care system at Holy Family Hospital in Spokane, Washington. Harris (1974) reported on the use of portable desks with medications and some supplies (in place of a nurses' station) as one part of reorganizing a unit to provide better care to patients and to better utilize baccalaureate degree registered nurses.

Several reports on the unit assignment system whose primary focus was on organizational mode also included some description of unit design. These reports included discussions of portable communication and supply stations close to patient rooms as one element of the system intended to increase direct patient care time. Unit assignment was defined as a method of decentralized ward organization in which the ward structure is divided into units of care corresponding to the patient classification system (intense, above average, average, and minimal care units). A unit on the ward was defined as the number of patients who can be cared for by a registered nurse and adequate nursing assistance. Similar categories of patients are grouped together on a unit in order to predict and equalize the workload among the staff members. When a patient's status changes, he may be moved to the appropriate unit on the ward or unit boundaries may be changed. Studies on this mode include those by Sjoberg and Bicknell (1969), Sjoberg, Heieren, and Jackson (1971), and Sjoberg et al. (1971), also discussed in detail in Chapter 7, Organizational Modes of Nursing.

In summary, the authors of the descriptive literature on unit design recommended that nurses be included in the planning of hospitals. They also recommended that model units be built to test the proposed design and to orient the staff to the new design. While there appears to be no consensus on the optimum number of beds per room, minimizing travel and maximizing patient-nurse visibility are viewed as two important factors in improving the efficiency of nursing unit design. Nurse servers, in conjunction with or apart from other features of the Friesen concept, were considered advantageous to improved nursing care.

DESCRIPTIVE-EVALUATIVE LITERATURE

The literature contains six chiefly descriptive articles presenting some quantitative findings relevant to nursing unit design and nurse staffing, although lack of sufficient detail on evaluation methodologies precludes a more specific discussion.

Girard (1978) claimed that the compact cluster design (20 beds in 12 rooms grouped into two six-room clusters), without nurses' stations but with supplies located at the point of use, reduced staff walking distance and maximized staff-patient visibility at Somerville Hospital, Boston. After one year, a superior level of care was being provided, as shown by 3.1 to 3.4 nurse hours per patient day; 14 percent less staff were required than on the five conventional nursing floors the new building replaced. Patients felt that they received more attention, although a few complained about the lack of privacy. Some physicians did not like the fact that they could not see a patient without being seen by other patients on the unit.

Porter (1973) described a demonstration project in which a multidisciplinary team designed a nursing unit based on a system of patient care which would put patient needs and interests first. The unit selected for the demonstration was a long, single-corridor design; changes consisted of removing the nurses station and putting nurse servers in each room. There was some initial confusion among the nursing staff, but almost all nurses liked the changes after several months. Although the author did not specify how these responses were elicited, reported reactions by physicians were not favorable, in that they did not like having the charts in the patient's rooms as they felt patients might look at them; also, physicians could not see patient charts without going into the room and seeing the patient also. Physicians also complained that nurses were not immediately accessible, as they had been when there was a nurses' station. On the other hand, the highest return rate for patient evaluation forms (figures not provided) was from this unit of the hospital and responses were entirely positive. Compared with a control unit in this hospital and results from an unidentified study of 55 units in eight other hospitals, nurses on the demonstration unit spent twice as much time with patients and the quality of care was said to be slightly better. The method of determining quality was not described. The staff felt that they were meeting patient needs without an increase in personnel and with relatively few structural changes.

Drue (1976) described a communication system incorporated into a remodeling and modernization program at Memorial Hospital Medical Center at Long Beach, California. Along with the communication system, everything needed for patient care was placed in or adjacent to the patient's room; as the central nurses station was eliminated, so was the need for numerous trips by nursing personnel to the station. A master communication station was established from which

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one could communicate with each patient and determine which patient was calling a nurse, where each nurse was located, and where and if there was an emergency. The author claimed that the system had improved patient care; that the nursing personnel found it to be extremely valuable and easy to use; and that physicians were pleased with it because of better patient care and speedier communications when they called a floor to obtain information or to give instructions.

Some descriptive-evaluative articles described early efforts to use more objective measures of nursing unit efficiency. Pelletier and Thompson (1960), for example, questioned the usefulness of the traditional measures of nursing unit efficiency based on density factors, i.e.: the number of beds per ten running feet of corridor, distance from the farthest bed to the nurses station, and beds per unit of area. Arguing that a more appropriate measure of unit efficiency would be the distance staff members travel in caring for patients, this article described in detail how the authors developed the Yale traffic index. Subsequently, they compared nineteen hospital inpatient nursing units of different designs and sizes by means of this index and of the three traditional measures of nursing unit efficiency mentioned above. They found no correlation among the four measures and concluded that the design, not the size of the hospital nursing unit, was the most important factor in determining unit efficiency.

An architect, McLaughlin (1961), also evaluated the efficiency of units with different designs. He compared the travel distance, total area, area per bed, and length of the exterior wall of architectural drawings of 12-bed, 24-bed, and 40-bed rectangular and circular nursing units providing approximately equal facilities for patients. He used a modified form of Pelletier and Thompson's (1960) Yale traffic index to measure travel distance and assumed that all patients were in the same patient care category. He concluded that circular units were inflexible and inefficient and that rectangular units were superior in almost every way. He recommended that architects and hospital administrators think twice before "going around in circles."

In a later evaluation, McLaughlin (1964) extended his 1961 work by including architectural drawings of eight different nursing unit designs, i.e., 12-bed circular, 12-bed rectangular, 24-bed circular, 24-bed rectangular, 40-bed single corridor, 40-bed double corridor, 40-bed circular with beds facing the corridor, and 40-bed circular with beds facing sideways. He compared the travel distance, total area, area per bed, length of the exterior wall, and cost factor per bed, finding the circular unit to be the worst of the units studied on six of nine measures. He concluded that the 24-bed rectagular unit could be constructed and operated much more efficiently than the circular unit.

In summary, the authors of the descriptive-evaluative literature found that nursing unit designs which eliminated the nurses' station and placed supplies at the point of use improved patient care. Several authors compared objective measures of nursing unit efficiency, such as walking distance, beds per unit of area, and total area to determine which unit design was most efficient. One evaluation found that design rather than size of the unit was the most important factor in determining unit efficiency. Two other evaluations found rectangular units superior to circular units in almost every way.

RESEARCH LITERATURE

Some descriptions of research on unit design as related to nurse staffing were contained in journal articles and other brief published reports. Since the full research reports which would substantiate these brief descriptions were not always available, a detailed critique of study methodologies was not possible. In the following, reported studies are reviewed by selected types of unit design.

Spoke Design

All of the research found on the spoke design hospital was conducted at Franklin County Public Hospital in Greenfield, Massachusetts, by a multidisciplinary team from three universities. Reported features of this design include a continuous belt of beds with a large number of beds per floor; charts and supplies located in each patient's room; and a central communications center. The spoke design permits changing boundaries between units as the needs of patient populations change (Morss 1970; Christenson 1970; "New shape for hospital addition leads to new arrangement of nursing unit" n.a. 1970).

Dornblaser and Piedmont (1970) and Piedmont and Dornblaser (1970) examined the effect of this spoke design on patient, nursing staff, and medical staff variables. In this study, the investigators tested the hypothesis that a spoke design nursing unit without a central charting station and with a reduced need for nursing staff to utilize associated service spaces would change the pattern of nursing care, so that more nursing service time would go to direct patient care. The following types of units in both the old 168-bed building of traditional design and the new spoke design building were studied and compared: (1) traditional design, no changes in physical plant or procedures; (2) spoke design, no changes in procedures; (3) traditional design with team nursing, no head nurse and central charting area; (4) spoke design with team nursing, no head nurse and central charting area; (5) traditional design with team nursing and workload increased by one-third, no head nurse and central charting area; and (6) spoke design with team nursing and workload increased by one-third, no head nurse and central charting area. The dependent variables included nursing personnel time and activities and satisfaction with work; patient welfare and satisfaction with care; and medical staff evaluation of the execution of their orders by the nursing staff.

The authors concluded that the spoke design maximized the effect of the research variables (practice of team nursing, elimination of head nurse and central charting area), but that similar effects were achieved, if to a lesser degree, in the old building. A greater amount of productive work was done by a smaller nursing staff, and more nursing time was devoted to direct care. There was a high level of nurse work satisfaction, and patient welfare and satisfaction increased in most areas. The authors claimed that a spoke design permitting a continuous belt of beds had distinct cost advantages. It allowed a more flexible, efficient, and economical scheduling of nursing care to fit patient needs, accentuated the advantages of team nursing without the traditional head nurse, and enabled a smaller nursing staff to devote more time to direct patient care.

Friesen Concept

A study conducted by CHI Systems Inc. of Ann Arbor, Michigan, to identify and demonstrate the impact of the Friesen system on nurse staffing, was reported by Charter (1970). Specific questions addressed were whether a Friesen hospital requires less nursing staff than a conventional hospital, and whether the concept of elimination of nurses' stations contributes to better utilization of nursing personnel.

Type of hospital design--Friesen or conventional--was defined as the independent variable in this study; nursing personnel walking time, nursing personnel time with patients, and the total number of nursing staff were the dependent variables. The study population in the Friesen hospital consisted of the nursing staff on one medical-surgical floor containing four nursing units in the Scarborough Centenary Hospital, Toronto, Canada. These units were compared, in terms of the dependent variables, with data for conventional hospitals obtained previously in several large studies, namely:

1. A study performed by the Bureau of Hospital Administration, University of Michigan, involving 55 nursing units in eight conventional hospitals (Bureau of Hospital Administration 1970);

2. Data from the Community Systems Foundation on 15 nurse utilization studies (Community Systems Foundation 1969);

3. Data from an American Hospital Association study on 55 conventional hospitals (Jacobs, Patchin, and Anderson, 1968).

In the Friesen nursing units studied, registered nurses walked 32 percent less and nurses' aides 52 percent less than the corresponding categories in the University of Michigan study. Team leaders in the Friesen hospital spent twice as much time in patient rooms than the head nurses in the American Hospital Association study. Registered nurses in the Friesen hospital spent 37 percent more time in patient rooms, and aides 20 percent more time, than their counterparts in the American Hospital Association study. In a 320-bed hypothetical hospital modeled upon the staffing of Scarborough Centenary Hospital, the Friesen system design and resultant staffing organization was assumed to reduce total staff required by 14 percent. Also, through the reduction of walking time and the elimination of the head nurse, the Friesen system provided for the same quality of patient care with 22 percent less staffing hours per patient day than in the study by the American Hospital Association, and 17 percent less than the average found in the study by Community Systems Foundation.

The author concluded that the physical design of the Friesen concept, in conjunction with organizational and systems innovations, had measurably improved utilization of nursing personnel, and that cost and utilization benefits were achieved without sacrificing the quantity or quality of patient care.

Radial or Circular Designs

The question whether nursing unit design has an impact on nursing staff activities and subjective feelings was examined by Trites et al. (1969). The settings selected for study consisted of four nursing units with a 27-bed radial design; four nursing units with a 27-29 bed double corridor design; and four nursing units with a 29-30 bed single corridor design. All were general care units in the Rochester Methodist Hospital in Rochester, Minnesota, which had been constructed as a type of laboratory for testing alternative designs for nursing units, hospital systems, and organizational factors ("Research made this hospital go round and square" n.a. 1967). The physical structure of the nurses' stations had been standardized during construction.

The dependent variables selected for study were nursing staff activities, travel distance, travel time, and time with patients; 28 major work activities and 24 location categories were defined. Nursing staff members' subjective feelings related to preference, working relationship, fatigue, tension, stress, anxiety, and absenteeism were examined by means of 14 attitude scales used in previous research. Also considered were the number of patients, the degree of severity of conditions, the characteristics of the nursing staff, and the operational status of mechanical systems servicing the units. Minor architectural and system differences investigated were related to the placement of toilet rooms within patient rooms, the presence or absence of windows in the corridor doors or walls of patient rooms, and the presence or absence of a nurse-patient verbal intercommunication system.

A number of conclusions were drawn. In overall comparisons, the radial design was superior to the double corridor and single corridor designs, and the double corridor was superior to the single corridor. Nursing personnel on radial units were found to travel less than on single and double corridor units, and less on double corridor units than on single corridor units. Furthermore, time saved in travel was converted into more time spent with patients on radial units than on double and single corridor units; time saved in travel on double corridor units was converted into more time with patients than on the single corridor units. A nurse-patient intercommunication system did not reduce the number of trips made by nursing personnel to patient rooms, even though the nursing staff on linear units felt the system to be of value. On nursing units of radial design, the intercom was neither utilized nor considered useful by the nursing staff. As for personnel preferences, the great majority of nursing staff preferred to work on radial units and felt that a radial design enhanced the quality of patient care. Patients and physicians were also found to prefer the radial units, physicians believing that the radial design enhanced the quality of patient care. Absenteeism was lowest on the radial unit, intermediate on the single corridor unit, and highest on the double corridor unit. Therefore, the authors concluded that the radial design unit produced better utilization of nursing staff time and was preferred by the nursing staff over double or single corridor designs.

Sturdavant (1960) compared intensive care nursing in circular and rectangular unit at Rochester Methodist Hospital, Rochester, Minnesota. Her specific hypotheses were that in a circular unit as compared to a rectangular unit there would be greater overall patient, family, physician, and nursing staff satisfaction and more effective utilization of nursing time. These hypotheses were verified. The author attributed the results primarily to the travel advantage (less distance from the center of the nurses' station to the entrance of patient rooms) and also to visual contact (an unobstructed view of each patient from the nurses' station) on the circular unit. Satisfaction was significantly higher among patients and family members on the circular unit. The utilization of nursing time was more effective in the circular unit since nurses in the rectangular unit required more time for travel and for monitoring patients.

Jaco (1967, 1972, 1973) performed a comprehensive, carefully designed and controlled experimental study on unit design. Its major purpose was to evaluate the effectiveness of the radial unit compared to the traditional single-corridor unit for minimal, intermediate, and intensive patient care in terms of type, level, and amount of nursing care; nurses' utilization of the unit; patient welfare; satisfaction and reactions to the units by patients, nurses, and physicians; length of patient stay; and care costs for general medical and surgical patients. A second purpose was to appraise the potential intervening influences of nurse staffing patterns and occupancy levels on the study variables. The study was to replicate, as much as possible, Sturdavant's (1960) study and to examine other variables possibly related to different levels of patient care in radial design units.

Among the numerous findings of this study, one is of major relevance to this review. There was less direct patient care on the radial unit compared to the single-corridor angular unit. Jaco tentatively attributed this finding to the fact that since the nurses could see all the patients from one location on the radial unit, there was no need to enter rooms periodically to check on the patients, in contrast to the single-corridor angular unit. Patients, nurses, and physicians expressed preference for the radial unit. No difference was found in patient welfare or length of patient stay according to the design of the unit. Furthermore, while having a smaller nursing staff to provide for bed patients permitted the radial unit to be operated at lower cost per bed than the angular unit, these cost differentials were not reflected in the average per diem charges to patients occupying the two units during the same period.

To summarize, the research literature included studies of the spoke design, the Friesen concept, and comparisons of radial or circular units with other designs. In general, nursing time was considered to be better utilized on units with new designs than on more conventional units. This was the finding of studies of the spoke design hospital, the Friesen concept of nursing care, and of radial or circular design units. Jaco's study found less direct care time needed on circular units than on single corridor units.

SUMMARY AND IMPLICATIONS: UNIT DESIGN

The literature indicates that the physical design of the hospital inpatient nursing unit may have some effect on nurse staffing. Firm conclusions cannot be drawn, however, as little research has been done on any specific unit design. Also, there is as yet no general agreement on which particular design has the greatest impact on nurse staffing. The descriptive literature recommended that nurses be included in team planning of the design of a new hospital. The value of constructing models of planned units to test the proposed design as well as to orient the staff was also discussed. Several authors defined optimum unit efficiency designs as those minimizing travel and maximizing patient-nurse visibility; others stressed the need to design units to meet the requirements of the mode of nursing care to be given.

The descriptive-evaluative literature included several studies that dealt with objective measures of nursing unit efficiency. Pelletier and Thompson (1960) developed the Yale traffic index by measuring the distance staff members traveled in caring for patients. McLaughlin (1961, 1964) used this index and several other criteria to compare architectural drawings of nursing unit designs, claiming that circular units were inflexible and inefficient and inferior to rectangular units in almost every way. Two descriptive-evaluative articles on differently designed nursing units eliminating nurses' stations and providing supplies at the point of use claimed use of nursing time to be more effective on newly designed than on conventional units.

In the research literature, Dornblaser and Piedmont and Piedmont and Dornblaser (1970) found that in a spoke design hospital eliminating the central charting area and head nurse, a smaller team nursing staff devoted more time to direct patient care than on a conventional unit. Charter (1970) reported on a detailed study comparing conventional and Friesen concept designs. Using data from previous studies, she found that team leaders, registered nurses, and nurses' aides spent more time in the patient's rooms, and that 15 percent to 22 percent less staffing hours per patient day were needed under the Friesen concept than in a conventional hospital.

Radial or circular units were also considered to have benefits for the patients and staff. Trites et al. (1969) found the radial design superior to double corridor and single corridor nursing units. They found that nurses preferred a radial unit design, and that there was less travel, more time with patients, less absenteeism, and generally better utilization of nursing staff time on the radial unit. Similarly, Sturdavant (1960) found that patients and their families preferred the circular to the rectangular unit for intensive nursing service. The utilization of total nursing time was also more effective on the circular unit. Jaco (1967, 1972, 1973), comparing nursing service on two different unit designs, found that on the radial unit there was less need for direct patient care and that it was preferred by patients, nurses, and physicians.

From these varied conclusions, it would appear that the study of the effect of the physical design of a hospital inpatient nursing unit on nurse staffing is complicated by the multiplicity of factors which must be considered. To date, there has not been a definitive study correlating these factors. Also, there are several important variables relevant to nurse staffing which the literature on unit design has not considered. For example, there have been no studies of the effect of unit design on the organizational mode of nursing practiced. Logically, it would seem that the Friesen concept of nursing care, with all supplies, medications, charts, etc., in the patient's room, would enhance primary nursing. On the other hand, it would seem that open circular units, where all nurses can see all patients and vice versa, would not be as conducive to primary nursing, as patients might call any nurse who is close for assistance.

Furthermore, the way staff are assigned to patients and the way they organize their work may have as much an effect on the time and distance nurses must walk as the actual design of the unit. These and other variables need to be considered before definitive conclusions can be drawn concerning the effect of various unit designs on nurse staffing issues.

THE USE OF COMPUTERS

The use of computers by hospitals dates back to the 1950s, when they were used primarily by the business office to tabulate patient charges, calculate payrolls, and control inventory. By the 1960s computer equipment had become more sophisticated, and hospital administrators saw its potential in automating health care activities. Nurses as well began to recognize the computer's potential for improving nursing practice and the quality of patient care, especially as related to charting, care planning and patient monitoring, interdepartmental scheduling and communication, and staff time assignment (Hannah 1976).

While the use of computers in hospitals lagged behind their use in industry and other business by approximately a decade, it seems that it followed the same process of development. According to Gue and Freeman (1975), this development started with a simple data processing system consisting of a large number of independent, transaction-oriented tasks which summarized inputs to produce reports. This system only saw single data elements, not interactions among them, and therefore lacked the structural information to tie tasks together. The next stage consisted of an integrated data system with multiple files which allowed all patient files to be updated when a transaction was put into the system. For this system to be effective, a thorough understanding of interrelationships within the organization was required. A further advancement consisted of information retrieval systems which permitted the user to request special or standard data elements from the system.

A true management information system combines the capabilities of these three systems and is considered the most effective solution to information handling. It both provides data to make decisions and supports and assists in the decision-making process. As stressed by Young (1968),

> The computer becomes a vital management decision tool only when the programming on which it relies for its operation has been specifically designed so as to synthesize the flow of information into a form that prescribes the action to be taken. This requires valid, internally programmed, abstracted models of the various functional parts of the organization, focused on the myriad decisions that need to be made and integrated to provide a total hospital decision system based on quantitative information produced by the system components (p.84).

Two comprehensive reviews of computerized hospital information systems have appeared in the literature in recent years (Shuman, Speas, and Young 1975; Austin and Greene 1978). They provide historical overviews, detailed descriptions and the various systems available, discussion of the usefulness and limitations of the systems, and extensive bibliographies.

The Medicus report by Jelinek et al. (1976) discussed nine works on computer related approaches to increasing nursing productivity and concluded that studies attempting to improve nursing productivity through computerization tended to be most successful when addressing specific applications. Although some new computer programs appeared promising, they lacked sufficient design to provide methods of evaluation which would accurately measure the effects on quantity and quality of care provided. Jelinek et al. recommended that where computer resources are available, nursing services should consider the desirability of using computerized nursing care plans. They also found that the key to a successful relationship between nurses and computers was the early involvement of nurses in the planning for the system.

Major advantages of computers were considered to lie in improved use of resources; reduced clerical and administrative functions, providing a hedge against inflation by replacing labor costs with fixed capital; and enhancement of quality of care by reducing errors, improving communication, and expanding the clinically oriented data base available to staff.

DESCRIPTIVE LITERATURE

The descriptive literature on the use of computers in hospitals included numerous articles describing computer systems, as well as several articles describing actual experience with computers. Very little of this literature related specifically to nurse staffing, however.

Rees (1978), in an attempt to help nurses understand the language used by systems analysis and basic computer elements, presented a detailed description of current types of computers, of major components of the digital computer, and of how computers work.

Farlee and Goldstein (1971) discussed the importance of having nurses make significant contributions to the implementation of computer assisted hospital information systems long before the system is installed. They related an experience in the actual implementation of one of these systems in a hospital where nurses were not involved in the planning. The subsequent difficulty of the nurses in adjusting to the system and modifying it to make it work for their tasks was described. Farlee (1978) described a computerized hospital information system and the functional changes which occur when such a system is introduced. These include increased formalization, centralization, and stratification, which should result in increased efficiency and productivity. Farlee said that positive results do not occur automatically and without careful planning and implementation processes. She also pointed out that functional changes tend to reduce the flexibility and options involved in decision making and to increase the standardization of work. Organization theory hypothesizes that these factors are inversely related to employee satisfaction and accommodation to change.

Two articles by Birckhead (1975, 1978) discussed the impact of technological advances on society in general and their implications for nursing. She saw a potential danger to nursing practice from an automation of the health care system and overreliance on monitors and computers to lie in the loss of patient-nurse contact. She stressed that the purpose of nursing has never been merely to assist in curing, but to offer a warm human relationship in helping people to work out a solution to their health problems. She concluded that automation as a labor saving device was to be advocated if it freed the nurse to show tenderness, concern, and interest in the patient. In her 1978 article, Birckhead included a brief description of an unpublished 1976 study by Ogonowski conducted to determine how nursing staff time was spent in a metropolitan medical center which used a medical information system for managing hospital communications. Ogonowski focused on how nurse staff time was spent in computer related activities as compared to other activities. She found that registered nurses spent an average of 15.6 percent of their total time in computer operations and related paperwork. Among all activity categories, there were only three activities in which nurses spent more time: basic nursing care, consultation with other nursing personnel, and special treatments. Computer related work was found to require more time than the patient care areas of teaching and counseling, talking with the family, socialization with the patient, and care planning combined. This suggested to Birckhead that use of computer technology per se does not release time for the registered nurse to use her clinical skills with the patients.

Wesseling (1972) described the development of a computerized history questionnaire which nurses used to interview patients on admission. The questionnaire appeared on the screen of a video terminal, where nurses recorded the patient's responses. At the end of the interview, the computer generated a problem list from which a basic plan of patient care was developed. Thus, the nursing history was standardized and the patient's responses were available to all staff caring for the patient. The author concluded that the use of standardized, comprehensive material that is instantly available provides not only for uniformity of standards but also for criteria by which quality and performance can be evaluated.

Somers (1971) and Smith, E.J. (1974) described the planning and implementation of an automated data processing system at Charlotte Memorial Hospital, Charlotte, North Carolina. They involved potential users in the actual design of the system and stressed the importance of this step in the ultimate success of the project. The nursing staff developed standards of care for patients based on indicators for care, such as identified needs, symptoms, etc. The nursing care associated with each indicator was recognized and documented and then coded into machine language, so that when the registered nurse wrote an order for nursing care and entered it in the computer, the computer would produce a printed care plan with instructions for the care needed to carry out the order. New forms were generated for each shift and the nurses recorded what they had done on these forms and added them to the patient charts at the end of the shift. The forms were also used by the nurses and supervisors to evaluate patient care given. The authors suggested that the nursing care benefits of this automated data processing system may have been more time for direct patient care and for the teaching and supervision of non-professional personnel; more opportunity to control quality of patient care through the establishment of approved standards of care used as guidelines for the nurse in planning individual care; better utilization of personnel; and a shortened report time at the change of shifts.

McNeill (1979) described in detail a computerized, problem oriented medical information system developed to deal with all aspects of patient care, using the problem oriented medical record as a framework and having the patient, not the health care provider, as its focus. This system has been under development at the Medical Center Hospital of Vermont since 1968. The long-range goal was the creation of a system for recording, manipulating, and retrieving all health data on individual patients over time. The system was to include inpatient and outpatient data and allow constant entry and retrieval of data at any place within the health care complex. The data being problem oriented, this concept could link all areas and components of the health care system by cutting across physical and organizational boundaries. With regard to nursing, it was claimed that the system facilitated the audit of an individual provider's work so that the thoroughness, reliability, analytic sense, and efficiency of the nurse could be measured and, when necessary, corrected.

In summary, the descriptive literature centered on discussions of different types of computer systems and stressed the need to include nurses in the planning and implementation of these systems. Several authors speculated that computer use would yield more time for direct patient care and for teaching and supervising nonprofessional personnel; more opportunity to control quality of patient care through the establishment of approved standards of care; better utilization of personnel; increased standardization of work; and shorter report time at shift changes. One article reported briefly on the results of an unpublished study of nursing staff time spent on computer related activities, which suggested that the use of computer technology does not automatically release time for the registered nurse to use her clinical skills with the patient.

DESCRIPTIVE-EVALUATIVE LITERATURE

A series of articles contained some findings on computer use relevant to nurse staffing, although detailed descriptions of the methods used were not provided.

Gerbode (1973) found a computerized monitoring system for seriously ill patients beneficial to nurse staffing. In the pilot unit described, the computerized system permitted a reduction of staffing to one nurse for every two patients, whereas previously one nurse per patient had been required. From the nurses' point of view, hours of tedious charting were eliminated and the nurses were free to perform more essential things, such as following the clinical course of the patient for abnormalities and regulating therapy.

Cornell and Carrick (1973) described the implementation of an automated patient care management system at the Texas Institute for Rehabilitation and Research. Standard care plans for patients with commonly seen disabilities were developed and then modified to meet individual patient needs. A computer generated two printouts, i.e., one patient care printout to be used at the bedside, and one station oriented composite printout which included all events scheduled for all patients on a given day. The computer appeared to save time, and communications among personnel caring for patients was improved. Cornell and Carrick also noted that patients in rehabilitation units require many more hours of direct patient care over a longer time than acutely ill patients. Further, they need care from personnel in many hospital departments, which makes the coordination of services and medical and nursing care a complex scheduling operation. The authors felt that the computer had assisted greatly in all these operations, and that its use had an impact on average length of hospital stay. They found that 20 patients with cervical spinal cord injuries averaged 120 days of stay before computer installation, while 20 similar patients treated during the first two years of computer use averaged 94.9 days.

Hilberman et al. (1975) described a computer based patient monitoring system that had been in use in the cardiopulmonary intensive care unit at Pacific Medical Center in San Francisco, California, for eight years. Their article also reported on the results of an objective evaluation of the effectiveness of the system. The evaluation documented system utilization by the clinical staff in terms of average number of interactions per hour and per post-operative hour, category of information requested, and type of user. A second, statistical study investigated the impact of the monitoring system on morbidity and mortality. Outcome variables included death rates, length of stay in unit, days on respirator, days with arterial line, number of arterial blood gases, and nurse-to-patient ratio per day. The authors found no difference between monitored and control groups. They concluded with a detailed discussion of the problems of evaluating the impact of monitoring systems.

Cook and McDowell (1975) and Norwood, Hawkins, and Gall (1976) described the implementation of an automated total medical information system at El Camino Hospital, a 450-bed district hospital, in Mountain View, California. In 1971, this hospital received a contract from the Bureau of Health Services Research and Development to undertake a comprehensive evaluation of the Medical Information System (MIS) developed by Technicon Medical Information Systems. Although little information was provided on study design, study samples, or data collection methods used in the evaluation, both articles discussed the evaluation findings and potential advantages of the system at length. Norwood, Hawkins, and Gall stated that the computer assisted in the delivery of patient care in three principal ways: as a custodian of medical and other patient data, making them readily accessible and current at all times; as an accurate communications device for rapidly transmitting orders or retrieving current information; and as an organizer of the computerized patient data base providing cumulative lab reports and seven-day medication summaries.

Both articles claimed that 94 percent of the nurses were in favor of the system after two years of operation, and 78 percent of the physicians were using it. Also, the system was reported to reduce nursing clerical work, thus providing increased time for activities involving professional nursing skills. It enhanced the quality of patient care or at least made room for improvements. It was also felt to increase accuracy, since it eliminated the need for multiple transcriptions and subsequent errors and reduced problems of illegible handwriting. A significant reduction in errors in executing orders and reporting results was observed. Patient care plans were computer produced for each shift, eliminating the need for a card file and providing a duplicate of the care plan for the nurse to use as a work sheet. As a result, there was less intershift reporting by nurses and improved continuity of care between shifts. Communication with departments in the hospital that did not involve the telephone was said to have improved. After a three-year experiment with the system, the hospital made a commitment to contract for its continuing operation. The authors concluded that the system was a valuable tool for use by health professionals to enhance the quality of patient care and improve the use of labor resources in a hospital.

Traska (1978b) described the Technicon Matrix Medical Information System successfully installed at Methodist of Indiana Hospital, Indianapolis. Four elements were considered essential in implementing the system: (1) comprehensive planning by each department before installation; (2) an intensive training and testing program; (3) a rigid but realistic 18-month implementation schedule; and (4) dedication of those involved in the program. Although the methods used in reaching these conclusions were not discussed, the author said that the advantages of this system included reduced transcription and clerical work for nurses, more time for patient care and treatment planning, elimination of problems with handwriting, elimination of lost charges, and shorter hospital stays as a result of more rapidly transmitted orders for tests and test results. On one nursing floor, where the computer terminal had been installed first, the frequency of medication errors was reduced by 80 percent over the total before the system installation. The author conceded that a computer system will not solve organizational or personality problems, and that breakdowns of the system were a serious drawback.

In summary, the descriptive-evaluative literature contained several findings relevant to computer use and nurse staffing. The analyses leading to the conclusions offered are subject to some question, however, and should be reassessed. One evaluation of a computerized monitoring system for seriously ill patients claimed that it was possible to use one nurse for every two patients instead of the previous ratio of one nurse per patient. It was also claimed that many hours of charting were eliminated and nurses were free to observe the clinical course of patients for abnormalities and regulate therapy. Whether they actually used this time for such functions was not investigated. Another evaluation of a computer based patient monitoring system in use in a cardiopulmonary intensive care unit found essentially no difference in the morbidity and mortality of patients between monitored and control groups. Several articles on medical information systems claimed that the use of these systems reduced clerical work; allowed more time for activities involving professional skills; provided for improvement in quality of care; reduced errors; improved continuity of care and communication; required less intershift reporting; and also led to shorter hospital stays for patients. All of these favorable outcomes of computer use, however, remain to be verified by more objective research.

RESEARCH LITERATURE

Only two studies on nursing questions were found to be related to computer applications. This lack of published research may be due to the fact that much work in this field is done as in-house projects by individual hospitals and computer companies, so that study approaches and data are not available for assessment. In both published studies the variables appeared well defined and the data collection procedures were reported in detail; however, issues of reliability and validity of the observations were not addressed.

Tolbert and Pertuz (1977) measured the effect of a computer based monitoring system at St. Mary's Hospital, Rochester, Minnesota, on the overall cost and quality of patient care in cardiovascular special care areas. Nursing activities and nurse opinions regarding one 12-bed computerized cardiac postoperative recovery unit and one 10-bed conventional cardiac postoperative recovery unit were studied. Both units received patients from the same surgical suites, discharged patients to the same intermediate care areas, and functioned within the same administrative structure. Patients were assigned to either unit by stratified random sampling; the number of patients included in the study was not given. Weekly nursing assignments were randomized to provide comparable levels of expertise, and randomized work sampling observations by trained observers were conducted 24 hours per day for 28 consecutive days. Data were tabulated by frequency of occurrence for various task categories, and comparative percentages were computed by unit, by job groups, and by shift, with differences between units tested for statistical significance.

The data from this study were labeled inconclusive, as both units experienced extremely low patient census during the study period. The investigators decided to repeat the study. In the replication, which used the same study design and methods, findings based on 8,236 individual observations of nursing personnel revealed that across each shift approximately 20 to 30 fewer minutes of direct patient care were rendered in the computerized unit. It was not clear from the report whether this reduction was considered a positive or negative finding. The day shift was found to use this time as standby time, and the evening and night shift used it for other "soft" areas, such as communication, reading, conferences, errands, housekeeping, and undetermined travel. Twenty-nine of the 52 nurses preferred the computerized unit, sixteen the conventional unit, and seven considered them equal. Computerized charting was favored by 31 over 17, 4 nurses having no preference. Analysis of hospital stays of surviving patients indicated that patients admitted to the computerized unit spent shorter periods in each phase of postoperative care than did patients admitted to the conventional unit. Other advantages were earlier recognition of cardiac arrhythmias and finer hemostatic monitoring.

The authors claimed that in order to take advantage of the nursing time made available as a result of computerization, it was necessary to review the methods used to determine nurse staffing on the unit. Furthermore, they concluded that while automated patient monitoring should relieve nurses of some routines, such as charting and checking vital signs, and increase the time available for direct patient care, actual increases in direct patient care per patient might not occur if each patient were already receiving the amount of care appropriate for his condition.

Schmitz, Ellerbrake, and Williams (1976) conducted a study of a computerized electronic information system at Deaconess Hospital in St. Louis, Missouri. They proposed that there would be a significant change in the distribution of activities by registered nurses and division secretaries after the installation of a computerized electronic information system. A fixed-interval sampling method was used. Using a uniform random number series, discrete time increments were selected and an observer recorded a description of the activities of various individuals. These observations were then coded by a single person to minimize bias due to multiple interpretations of observations.

Analysis revealed a statistically significant change in distribution of registered nurse activity time. A decrease was observed in use of the telephone, transporting of patients and items, and writing and processing of requisitions, as compared to an increase in time spent in conversing with personnel regarding instructions. There was no statistically significant change in registered nurse activity time spent on charting, medications, other patient care, idle time, or conversation with patients. A significant decrease in telephone time and time spent conversing with personnel was found for division secretaries, matched by a significant increase in time spent in handling supplies and clerical duties. In general, the authors claimed the computer system had a positive effect on the daily activities of the registered nurses and division secretaries. They felt the system resulted in greater accuracy in communications and redistribution of the workload, allowing nurses more time for patient care.

In summary, the research literature on computer applications related to nurse staffing was limited to two studies, both of which presented favorable findings regarding computer use. One study dealt with a computer based patient monitoring system which resulted in approximately 20 to 30 fewer minutes per shift of direct patient care in a computerized cardiac postoperative recovery unit. Analysis of hospital stays of surviving patients indicated that patients admitted to the computerized unit spent shorter periods in each phase of postoperative care than did patients admitted to a conventional control unit. The other study on computer applications which was relevant to nurse staffing found significant changes in some nursing activity patterns, but no change in other nursing activities, primarily those related to direct patient care.

SUMMARY AND IMPLICATIONS: THE USE OF COMPUTERS

The descriptive literature discussed varied computer uses and its potential advantages and disadvantages with regard to nursing. A number of articles suggested that with computerization on the unit, nurses might be able to devote more time to direct patient care, but Birckhead (1978), describing results of an unpublished study by Ogonowski (1976), suggested that use of the computer may not necessarily result in an increase in the amount of direct care provided by the nurse.

The descriptive-evaluative literature also discussed the many benefits to nursing and patient care which may result from computer use. Most of the articles which were reviewed suggested that computer use may lead to improvements in staff communication, organization, and quality of care; reductions in medication and other errors and in patient length of stay; and increases in the amount of nursing time available for patient care. The evaluation methods used to reach these conclusions were not reported in detail. In the descriptive-evaluative literature reviewed, only Hilberman et al. (1975) found no difference in patient length of stay, nurse-patient ratios, and other outcome variables between monitored and control groups.

The two research reports reviewed found that computer use had a beneficial effect on nursing. Schmitz, Ellerbrake, and Williams (1976) concluded that the computer system resulted in improved communications and a redistribution of workload and allowed nurses more time for patient care. Tolbert and Pertuz (1977) found several positive outcomes of computer use with regard to patient monitoring and postoperative progress. They also reported that on their computerized study unit less time was spent on direct nursing care, but did not explain whether this was considered a favorable or unfavorable result of unit computerization. Tolbert and Pertuz concluded that automated patient monitoring may increase the time available for direct care, but that the amount of direct care may not actually increase with computer use if patients are already receiving the appropriate amount of care.

Thus, the literature review yielded little concrete evidence that the use of computers has a clear effect on nurse staffing. Furthermore, the lack of repeated research on any specific computer system makes it difficult to draw general conclusions. Unfortunately, none of the literature which was reviewed mentioned the organizational mode of nursing practiced. As a result, it is not possible to determine how the use of computerized medical information systems differs among units practicing primary nursing, team nursing, and other organizational modes, or what effect computer use may have on the mode.

The question also remains if the use of computers in fact results in improved quality and continuity of care. Several of the authors found that computer use reduced clerical work for nurses, thus freeing them to use their professional skills in direct patient care. It remains to be studied if the nursing time saved actually is used in direct patient care. If it were so used, the number and kinds of staff needed on the unit might be affected. Finally, it must be asked if functional changes, such as increased formalization, centralization, and stratification, that occur when computerized hospital information systems are introduced, in fact result in increased efficiency and productivity. If so, it remains to be shown whether they are accompanied by a reduction in flexibility and lower job satisfaction, and require changes in staffing methodologies.

THE UNIT DOSE SYSTEM

The unit dose system of medication distribution is a pharmacy coordinated method of dispensing and controlling medications in health care institutions (American Society of Hospital Pharmacists 1975). Medications are contained in single unit packages, dispensed in a ready-to-administer form where possible, and for most medications not more than a 24-hour supply of doses is delivered to or made available in a patient care area.

The unit dose system originated in the early 1960s in a joint effort by industrial engineering, medicine, pharmacy, nursing, and administration to improve the utilization of professional personnel (Goldman and Bassin 1964). The system is still far from standardized, however, and may vary from hospital to hospital. Even within a single hospital, a centralized pharmacy may service the entire hospital, or decentralized or satellite pharmacies may service only a fraction of the nursing units. Many use drug carts which are filled for each unit; others have nurse servers in each patient's room with a special drawer for medications which are filled by the pharmacist or pharmacy technician; still others have drug trays which are delivered to nursing units just before the nurse is to administer medication. In most hospitals, the pharmacists or pharmacy technicians fill the drug carts or nurse servers and the nurses administer the medication; in a few, the pharmacists or pharmacy technicians not only dispense but also administer the medication.

From its introduction to the time of widespread adoption of the system, mainly between the mid-1960s and mid-1970s, numerous studies of unit dose drug distribution have been published. Few publications have appeared since 1974 and this review of the literature therefore includes some earlier, relatively limited work pertinent to nurse staffing.

In general, most studies indicated that the advantage of unit dose systems lies in greater safety for the patient, greater efficiency and economy, and more effective utilization of professional resources (American Society of Hospital Pharmacists 1975). The potential advantages of the system for nursing would appear to be a more efficient use of nursing personnel time and a reduction in medication errors.

Jelinek et al. (1976) included reviews of several articles on the unit dose system which indicated that the system improved nursing productivity. Jelinek et al. recommended that hospitals institute the unit dose system, on the grounds that it provided nurses with more time. To assure that the nursing time saved would be used for more effective patient care, they also recommended that the change be accompanied by either staffing adjustments or in-service education.

DESCRIPTIVE LITERATURE

Very little of the descriptive literature on the unit dose system dealt specifically with nursing. It was generally claimed that nursing time spent on medication activities could be decreased by such aspects of the unit dose system as a revised medication form (Corbett 1975), computerization of the unit dose system (Trudeau 1976), and a new method of distributing refrigerated doses of medication (White, Miller, and Godwin 1975). Stewart, Kelly, and Dinel (1976), offering a nursing perspective on the unit dose system, favored a system with nurse servers in each patient room so that nurses could concentrate on one patient at a time and assess individual patient response to drug therapy.

DESCRIPTIVE-EVALUATIVE LITERATURE

Although some descriptive-evaluative case studies relevant to the unit dose drug distribution system and nurse staffing were reviewed, the lack of sufficient detail on evaluation methods used does not permit a critical appraisal of the findings; these findings should, therefore, be viewed with reservation.

Martin (1970) reported on a nursing activity study conducted at the Ohio State University Hospitals in 1968 which was specifically concerned with nursing time spent on medication activities prior to the introduction of a unit dose system. It was found that during a 24-hour period on five nursing units studied, a registered nurse spent an average of 47.3 percent of her time with medication procedures (ordering, 2.5 percent; preparing, 19.7 percent; transporting, 7.6 percent; administering, 11.1 percent; charging, 6.4 percent). During the day and evening shifts, approximately 65 percent of registered nurse time was spent on the various aspects of medication procedures as compared to approximately 20 percent on the night shift.

The nursing staff expressed concern that when a unit dose system in which pharmacy personnel would administer medications was implemented, an important nursing component in medication procedures might be lacking. A further evaluation was then undertaken to compare what nurses said they did to their actual performance and knowledge. Also, the performance of nurses in administering medications to patients was compared to that of pharmacists trained for this task. It was found that both nurses and pharmacists were inconsistent in following what nurses claimed to be desirable behavior. No difference was found between the performance and knowledge of nurses and pharmacists in administering medications. Based on these findings, nursing agreed to proceed with the pharmacy-coordinated unit dose drug dispensing and administration project.

Rosenberg and Peritore (1973) examined the nursing time spent in three systems of drug distribution: an old system with a combination of floor stock and some individual prescriptions; an intermediate system with a minimum floor stock and a greater number of individual prescriptions; and a new unit dose system. The evaluation was conducted on a 28-bed surgical unit in a community hospital over a two-year period. The authors found that nursing time used in medication activities decreased from 16 hours per day in the old system to from 5 to 7 hours per day in the intermediate system and 1.5 hours per day in the unit dose system. The average nurse-hour reduction due to conversion to the unit dose system was judged to be at least 5 hours per day per nursing unit. The authors claimed that the system would save 20,075 hours on the eleven nursing units in this hospital. They stressed, however, that when studying the impact of the unit dose system on nurse staffing, it must be realized that the time savings may not be completely usable, as they do not occur as blocks of time but are spread throughout the day. The authors claimed that other advantages of the system included decreased medication errors, better drug control, no wastage (medications returned to the pharmacy can be redispensed), and more accurate patient billing.

Pang (1973, 1977) reported on two evaluations conducted one year and seven years after initiating the unit dose system in a 30-bed private hospital. He estimated that replacing the traditional 8-hour narcotic audit with unit dose narcotic control would lead to a savings of about 3,000 hours of nursing time per year, or about $12,000 per year for narcotic control alone. He claimed that nursing time was also saved in the preparation of medications, checking of medication cards, and recording of medications given. Pang's general assumption was that because of the effectiveness of the unit dose system, more nursing time would be available for direct patient care. No data were presented, however, to substantiate that the nursing time saved did, in fact, go into direct patient care.

Cassell and Shilling (1979) studied nursing activity in the Greenville, South Carolina, Hospital System. As part of their study of eight hospitals with 1,128 beds, they found that introduction of the unit dose drug administration system had drastically reduced the nursing time required to complete medication procedures.

In summary, the descriptive-evaluative literature reviewed claimed that a substantial amount of nursing time previously spent on medication procedures was saved under the unit dose system. Several authors argued that the time saved would or could be used for direct patient care, but since none presented data showing that this had in fact occurred, more rigorous studies are needed to support these claims.

RESEARCH LITERATURE

Research efforts on the unit dose drug distribution system were numerous but most are only indirectly related to nurse staffing. Simon, LeMay, and Tester (1968) investigated the attitudes of nurses, physicians, and pharmacists toward a unit dose system in which a pharmacy substation was located on the same floor as the wards served and was open 24 hours per day at University Hospitals, Iowa City, Iowa. Several weeks before the new drug distribution system was implemented, all nursing service personnel on the demonstration wards were given a short questionnaire designed to elicit their opinions of various aspects of the drug distribution system. The same questionnaire was readministered after the unit dose system had been in operation for ten months, providing test-retest results on changes in attitude as a function of the new method of drug distribution. In addition, after the unit dose system had been in operation for ten months, a second questionnaire was administered to all nurses, physicians, and pharmacists who worked under the experimental system. This questionnaire contained eight common core items to which each of the three professional groups responded, as well as a number of other questions directed specifically at one or the other of the three groups. Percentage comparisons were used to analyze these questionnaire data.

With the exception of senior staff physicians (medical school faculty), all three groups were favorably disposed toward the new system. A majority believed it superior to the conventional system in overall efficiency and desirability, and felt that it reduced medication errors. Nurses felt that they had more time for direct patient care and that the overall quality of care had improved. Residents and interns responded favorably with regard to the availability of pharmacists for consultation on drug matters. They were also impressed with the speed with which medications were supplied. Pharmacists felt that their professional training was being utilized more fully. It was not clear why the senior staff physicians responded unfavorably to the system. The investigators suggested that it may have been due to failure to orient these physicians properly to the new system and to involve them intimately in its development.

Slater and Hripko (1968a,b) reported on a study at the Charles F. Kettering Memorial Hospital in Kettering, Ohio, a 400-bed denominational hospital. Slater and Hripko (1968a) first discussed the implementation of a unit dose system on a 45-bed medical-surgical unit and the design of a comparative study of the traditional and the unit dose drug distribution system. In this hospital's unit dose system, medications were prepared by the pharmacy department and delivered to the unit for administration by nursing personnel three times per day. In their second article, Slater and Hripko (1968b) described the study in detail. They tested the hypothesis that the unit dose system would provide a safer system of drug distribution, would better utilize the skills of pharmacists and nurses, and could be instituted within budget limitations and without making specific changes in the pharmacy service and facilities. An independent industrial engineering organization was retained to collect the data and guide the study.

The study was conducted in three phases: (1) study of drug related activities and distribution expenses under the traditional system; (2) implementation of the unit dose system and operation for at least one month in an effort to orient all personnel; and (3) study of the unit dose system by the same methods as in Phase 1. Data were collected by work sampling techniques (random observations of the activities covering all work on the unit), with each individual's activities classified to determine the percentage of time spent on each function. In the pharmacy section, each employee classified daily activities into preestablished categories. In addition, time study observations were made for those elements for which it was possible to observe task performance both in the pharmacy and on the nursing unit. Data collection was handled by graduate industrial engineers who conducted the series of on-site interviews and time studies. Volunteers were also trained for one week by this group to assist in the work sampling studies. No mention was made of testing for the reliability and validity of the data collection instruments or for observer reliability.

The results of the study showed a 61 percent reduction in nursing time for drug preparation and clerical effort related to drugs under the unit dose system. Nursing time in the presence of patients as observed under the traditional system was 33 percent of the total available time, or approximately two hours and forty minutes per nursing shift, but 36 percent, or three hours and five minutes, under the unit dose system. The investigators pointed out that the study findings were affected by a 21 percent reduction in nurse staffing on the study unit during the unit dose stage of the study, and that if the staffing level had remained the same as in the first stage, a more significant increase in nursing time devoted to patient care would have been realized. Time spent in clerical activities by all personnel on the unit decreased slightly.

The nursing labor cost for drug preparation and clerical effort amounted to $0.0685 per dose in the traditional system and $0.0271 per dose in the unit dose system. The pharmacy labor cost for dispensing and clerical effort amounted to $0.0150 per dose in the traditional system and $0.0245 per dose in the unit dose system. The investigators did not state how the reduction in nursing time was to be utilized, i.e., whether by reducing nursing staff so that cost savings could be reflected in the hospital operating costs, or by increasing patient care at no additional annual operating cost.

Slater et al. (1972) reported on a follow-up study conducted in 1970 in the same hospital after the unit dose system had been made operational on a hospital-wide basis. Pharmacy costs were found to be $21,500 more per year than for a traditional drug distribution system. Nursing activities were examined by means of a computerized Work Measurement Sampling technique (Schmid 1970). The data indicated a definite improvement in the percentage of time spent by each type of nurse at the patient's bedside, even though there had been a definite decrease in staffing hours per patient day between 1967 and 1970. The documented savings in nursing costs between 1969 and 1970 were $196,000.

Barker (1969a,b) reported on a three-year project at the University of Arkansas Medical Center to evaluate an experimental centralized unit dose system. The two articles reviewed are only brief summaries of a final report; hence, it is difficult to appraise study methods and findings. In the published articles, Barker compared the experimental system with the conventional system in terms of medication errors; utilization of pharmacy and nursing personnel; attitudes of nurses, pharmacists, and physicians; costs; and legal implications. Due to problems beyond the investigator's control, the conventional system was studied for six months and the experimental system for only two months.

Medication error rates were determined by a trained observer accompanying the medication nurse continuously throughout her entire 8-hour shift. The observer recorded the name and dose of every drug, the time when it was administered, and the name of the patient to whom the drug was given. The observer's notes were compared with the patient charts and possible discrepancies were noted. These discrepancies were then reviewed by two pharmacists and a nurse. The ratio between the total number of errors on each workshift and the total number of doses ordered and/or administered was the criterion measure for errors. Utilization of pharmacy and nursing personnel was determined by work sampling methods. Attitudes of nurses, pharmacists, and physicians were measured by questionnaires and interviews. Costs were obtained by sampling and by conventional cost finding methods. Legal implications were explored by standard methods of legal research.

Barker found that the mean medication error rate during the experimental period for all comparable error types combined was less than during the control period. In the control period, nurses had spent more time (13.7 percent of total nursing time) in the preparation of drugs, distribution, and cleanup, and in personal and other activities. Of the time saved under the experimental system, 5.9 percent was transferred to clerical work and 7.7 percent was transferred to bedside nursing, division management, and administration of drugs. The nurses favored the unit dose system more than the pharmacists did, and the house staff had mixed opinions. The nursing supervisors for each 8-hour shift were asked to estimate how much time they spent obtaining and preparing medications during the control period, when the pharmacy was open only Monday through Friday from 8 A.M. to 4:30 P.M. The day and evening supervisors estimated they spent 38 percent and the night supervisor 43 percent of their time in these activities. In the experimental period, when 24-hour pharmacy service was provided, the supervisors did not have to spend any time obtaining or preparing medications. In terms of nurse staffing, Barker (1969b) pointed out that the experimental system was intended to improve the utilization of already purchased nursing time, and not to reduce the number of nurses employed. The absolute annual cost of nursing personnel was reduced by $41,026 under the experimental system.

Fowler and Spalding (1970a,b) reported on trials of the unit dose system at Sewickley Valley Hospital, Pennsylvania, a 269-bed non-profit institution. They described the conventional drug system and the steps that were taken to implement the unit dose system, as well as a pilot study on a 22-bed unit. The nurses on this unit were asked to keep a daily log of comments about the system. These logs revealed that the nurses liked the unit dose system and felt it offered a high degree of safety, accuracy, and convenience, while saving valuable time.

Fowler and Spalding (1970b) also reported on findings from a study which compared the amount of time required for drug distribution under unit dose and traditional systems. The method used was to observe work on the study unit and compare these observations with those taken as work samples from the other nurses' stations in the hospital. All data and measurements were collected and tabulated by the pharmacist. The reliability and validity of the data collection procedures was not discussed. The investigators found that it took 12.5 hours per day of nursing time in the traditional system and 5.8 hours per day of nursing time in the unit dose system to pour, administer, and chart medications. When all steps, from transcribing the order to charting the drug after it was given, were considered, it took 16.45 hours per day of nursing time in the traditional system and 6.69 hours per day of nursing time in the unit dose system. Fowler and Spalding collected and analyzed data on numerous other factors related to the pharmacy and the unit dose system which are not specifically relevant to nurse staffing patterns and are not reported here. The investigators concluded that conversion of pharmacy services to the unit dose system would require an increase in pharmacy personnel and equipment, but would improve the overall efficiency of medication handling, better utilize nursing personnel, and help reduce medication errors.

Yorio et al. (1972) conducted a study of cost differences between traditional pharmaceutical services and decentralized unit dose services at Buffalo General Hospital in Buffalo, New York. Three senior pharmacy students conducted time studies on two floors with unit dose service (one 24-bed medical teaching unit and one 24-bed private medical unit) which had been on the unit dose system for six months prior to the study, and on two traditional units (one 26-bed medical teaching unit and one 26-bed private medical unit). Each unit was studied from 7:00 a.m. to 11:00 p.m. on two consecutive days to determine the time involved in drug ordering, preparation, administration, charting, and miscellaneous drug related activities, such as emergency orders. Each activity was timed and recorded in minutes and seconds on a prepared form. In addition to time and function studies, general comments and observations were recorded. An inventory of medication and equipment was taken and adjusted budgets were calculated. Analysis included enumeration of time study data and calculation of cost per patient day and average weighted costs. The method of selecting the experimental and control units was not discussed. The reliability and validity of the data collection procedures were not addressed, nor was the data collection form described in detail.

Comparison of personnel costs showed an increase in pharmacy costs under the unit dose system of $0.31 per patient per day and a decrease in nursing costs of $0.50 per patient per day. The total, hospital-adjusted budget calculated for this study decreased by $0.15 per patient per day, while equipment expenditures increased the cost of drug distribution by $0.02 per patient per day, based on a five-year depreciation schedule. A total savings of $0.23 per patient per day was found under the unit dose system.

Schnell et al. (1975) conducted a cost study of a computer-assisted unit dose system at University Hospital, Saskatoon, Saskatchewan, Canada, the first hospital in Canada to utilize a computer for unit dose drug distribution. The three objectives of the study were to determine the total cost of obtaining and administering a unit dose of medication on each of seven nursing wards during the period from April 1 to June 30, 1974; to determine the total cost per patient day of operating the drug distribution system on each of the seven wards during the same period; and to compare the total cost per dose on four of the nursing wards with data from an earlier study conducted on the same wards. Included in "cost" were pharmacy personnel, drugs, inventory holding, pharmacy supplies, data processing, nursing personnel, medication supplies, and overhead.

The investigators found that the total cost per dose administered ranged from $0.7618 on one ward to $1.5996 on another, with a mean cost of $1.0183. The total cost per patient day under the unit dose system ranged from $5.8321 on one ward to $10.5708 on another, with a mean cost of $7.7207. Cost per dose administered increased approximately $0.31 between 1970 and 1974. Part of this increase was due to a 35-40 percent rise in salaries of pharmacy and nursing personnel and a 54 percent increase in mean drug cost for the four wards.

Schnell, Anderson, and Walter (1976) and Schnell (1976) reported the most comprehensive and carefully controlled study of the unit dose drug distribution system reviewed. In four hospitals in different parts of Canada over a three-year period, the investigators compared the following factors under traditional and unit dose drug distribution systems: utilization of professional and nonprofessional pharmacy personnel; time spent by nursing personnel on medication activities; total cost per dose of medication administered and per patient day; percentage and types of medication errors and the clinical significance of observed errors; and changes in job satisfaction and attitudes of registered nurses and pharmacy personnel toward medication procedures and pharmacy service. The four study hospitals were not identified by name. Hospital A was an 85-bed general hospital located in Saskatchewan, Hospital B a 183-bed general hospital located in Newfoundland, Hospital C a 298-bed general hospital in an urban center in Manitoba, and Hospital D was a 592-bed general hospital in a large urban center in Ontario.

Five substudies were conducted at each hospital during Phase 1 and repeated in Phase 2. Phase 1 involved a two-month study of the traditional drug distribution system at each hospital. Each hospital was then given twelve to twenty-four months, depending on its size, to implement the unit dose system. Phase 2 studies were again conducted in two-month segments. The study instruments were tested prior to the studies, and the observers were trained during a two-week pilot study at University Hospital, Saskatoon, Saskatchewan.

Work sampling techniques were used to determine the proportion of time spent in various activities by pharmacy and nursing personnel involved with the drug distribution system. For the study of nursing personnel, systematic sampling at fixed intervals was used on all work shifts for a period of eight consecutive days. The pharmacy study included all personnel in the pharmacy department for all hours of operation over an eight-day period. For each category of personnel, the frequency of occurrence of each activity category was counted and converted to a percentage of total available working time. Analysis of results, using a chi-square test applied to each activity category and to the overall frequency distribution, revealed a statistically significant change in patterns of work for both pharmacy and nursing personnel. For registered nurses, a significant reduction under the unit dose system (ranging from 11.9 percent to 42.1 percent) was observed in the percentage of time devoted to medication activities in all four hospitals. This reduction in medication time was spread over all shifts. The greatest reduction occurred on the night shift; the nursing time freed appeared to go into personal activities or direct patient care. Pharmacy personnel were found to spend more time on inpatient dispensing and information activities and less on personal time under the unit dose system.

The study of costs of the drug distribution system in each hospital during Phase 1 and Phase 2 used the methodology described by Schnell et al. in their 1975 study. The overall cost per dose increased by approximately 20 percent in two hospitals and decreased by 13 percent in the other two hospitals. Personnel costs appeared to be the most important factor in determining whether total costs increased or decreased under a unit dose system, as they accounted for between 67 percent and 80 percent of the total cost per dose. Any increase in pharmacy staff would thus have a large effect on total cost unless a corresponding reduction in nursing time could be obtained, and the authors stated that a reduction in total nursing time was questionable given the fact that the greatest decrease in medication activity occurred on the night shift, when staff was already at a minimum.

The medication error study used direct observation techniques. A medication error was defined as a deviation in the dose actually administered from the physician's orders in the patient chart. It was found that under traditional drug distribution systems the error rate, excluding wrong time errors, was approximately 10 percent, compared to 6 percent under a unit dose system. Again, excluding wrong time errors, medication errors under both systems were found to have the same potential clinical significance.

A job satisfaction and attitude questionnaire was administered to nurses and pharmacy personnel in both study phases. A short questionnaire was also prepared for distribution to patients to determine their reaction to unit dose packaging of medications. The investigators found no significant change in overall job satisfaction or attitudes toward medication procedures and pharmacy services when the traditional system was replaced by a unit dose system. Pharmacy and nursing personnel generally favored a unit dose system when asked to compare specific aspects of the two systems, and patients favored unit dose packaged medications because the doses were labeled and more sanitary.

The investigators concluded that while a unit dose system has the potential for offering an improved level of pharmaceutical service in hospitals, it does not automatically solve problems existing in most traditional systems. They identified personnel costs as the greatest single factor in determing total costs under a unit dose system, and included a series of recommendations both on how to improve traditional drug distribution systems and on how to implement the unit dose system.

Finally, several studies which were reviewed looked specifically at medication error rates in traditional drug distribution systems compared to unit dose systems (Hynniman et al. 1970; Shultz, White, and Latiolais 1973; Means, Derewicz, and Lamy 1975; Walters, Barker, and Wilkens 1979). All found that there were significantly fewer medication errors in the unit dose system than in the traditional systems. This reduction in medication errors seemed to be due to the checks incorporated in the new system, i.e., both pharmacist and nurse independently reviewed medications prior to administration to the patient.

In summary, the research literature reviewed on the unit dose system generally reported favorable outcomes of the institution of this system of drug distribution. Nurses believed the system offered a high degree of safety, accuracy, and convenience, and felt that the time saved provided more opportunity for direct patient care. Pharmacists believed their professional training to be better utilized. Patients liked individually wrapped medications and felt that they were more sanitary than drugs administered in conventional drug distribution systems. Residents and interns liked decentralized pharmacy services because the pharmacists were more readily available for consultation on medications. In relation to nurse staffing, the unit dose drug distribution system appeared to reduce the amount of time nurses devote to drug related activities. Only in a few studies, however, did the investigators find that some of the nursing time saved by the unit dose system was indeed spent in direct patient care. Nursing labor costs were also found to decrease with a unit dose system, offsetting its generally higher pharmacy costs. Finally, many investigators found that medication errors had decreased under a unit dose system.

SUMMARY AND IMPLICATIONS: THE UNIT DOSE SYSTEM

It appears from the articles reviewed that nursing time spent on medication activities is reduced by unit dose drug distribution systems compared to more conventional systems. The few studies which examined how this time was used by nursing personnel reported that at least some of it was transferred to direct patient care.

As most medication activities peak at specific hours during the day, it is questionable if the actual number of nurses employed can be reduced because of the time saved by the unit dose system. Most investigators sought to improve the utilization of already purchased nursing time and not to reduce the number of nursing personnel. In the two studies where the number of nurses did decrease during the study period, cost savings were realized while nursing time in direct patient care increased.

The impact of the unit dose system on particular nursing modes has not been studied. It would appear that the time saved by the unit dose system may be more apparent where functional nursing is practiced. In this case, the nurse assigned to medications for the day may have such a decrease in workload that she can be assigned to other duties or her position could be eliminated. In team nursing or primary nursing, where medication activities are dispersed among members of the staff, the time saved by the unit dose system may not be as obvious. It would seem, however, that no matter what type of organizational mode, a significant time savings and other advantages would be realized.

A remaining question is whether the quantity and quality of direct patient care increases with the unit dose system. There is some evidence that quantity of care increased slightly in the studies reported, but no evidence was presented, other than a reduction in medication errors, that the unit dose system affected quality of care.

Chapter 9

SUMMARY AND RECOMMENDATIONS

In Chapter 1 of this monograph it was argued, based on a great deal of past research, that patient demands for care in the acute care inpatient setting are highly variable and subject, to a large extent, to underlying chance phenomena. As a result, nursing has continuously been faced with the necessity of anticipating patient care needs and responding rapidly with appropriate care activities in circumstances characterized by a high degree of uncertainty. This situation has led to the development of a variety of more or less rational staffing methodologies aimed at the effective allocation of nursing resources. The major objective of this monograph was to review and critique the literature on factors perceived as affecting nurse staffing.

Many such factors exist. In Figure 2 a framework integrating these factors was proposed that portrays the delivery of nursing care as an organizational system in which inputs are acted upon by operational factors and influenced by environmental factors in order to produce an output. Of the factors shown in Figure 2, two emerge as fundamental: one is patient care requirements, considered as an input; the other is the organizational mode of nursing, considered as an operational factor.

The variable nature of patient care requirements has been dealt with by the development of patient assessment and classification procedures for determining levels of care to be provided. Most patient classification schemes are based on the concept that care predictions can be expressed as a function of patient populations categorized in terms of their individual care needs; such care predictions provide the basis for specifying nurse staffing levels for a given patient mix. Inextricably related to these staffing methodologies, however, is the formation of an appropriate organizational mode for the delivery of nursing services; as patient classification procedures have been developed, organizational modes have evolved, ranging from the case method to the team nursing mode and, more recently, to the primary nursing care mode. Clearly, the organizational mode will dictate the kind of staffing methodology that can be implemented; in turn, staff availability and the method used for the allocation of staff will constrain the kind the organizational mode that is possible.

The framework proposed in Figure 2 did indeed provide an effective guide for the review and critique of the literature. It was found, in general, that a large body of literature exists regarding patient classification systems and their use as a means for staffing inpatient units. Most of this literature is based on rigorous research with validated results. Similarly, a large body of literature now exists on organizational modes; most of this, however, addresses primary nursing care. In contrast to the literature on patient classification, the literature on organizational modes was found to be largely descriptive, with relatively few systematically conducted studies.

The literature search found that many of the other factors in the conceptual framework have been sadly ignored. Those that are discussed have not, as a rule, been the subject of rigorous research efforts. In most instances where research has been conducted, one or two factors have been considered in isolation from many other relevant factors, cetera desunt; or, one factor has been taken as an independent variable with the other as a dependent variable without regard for interactions with other variables, under assumptions of ceteris paribus.

The discussion that follows summarizes the findings of the literature search and critique under the major headings of input, operational, and environmental factors. It should be stated at the outset that overall, the results are disappointing and indicate a crucial need for more and focused research in the future. In fairness, however, the comment by Aydelotte (1973) that "...the number of variables with which one must deal is almost incomprehensible and, for the most part, the nature of the variables appears to defy description and quantification... "(p.59), aptly describes the obstacles to such research.

A SUMMARY OF FINDINGS

INPUT

The framework for the review and critique of the literature presented in Chapter 2 delineates a number of input variables considered important to nurse staffing. These include the philosophy, goals, and policies of the institution; personnel factors such as budget, staffing pattern, availability, education and skills, and motivation; and patient factors such as requirements for care. No literature was found that related the philosophy and goals of an institution to nurse staffing. It is conceivable, however, that an institution's philosophy of care, as expressed by its standards of care, indirectly affects the amount and nature of nursing care provided. The absence of literature linking philosophy of care to staffing may in part be due to the absence of sensitive instruments linking staffing levels to quality levels. The postulated relationship between hospital policies and nurse staffing, while not directly established in any of the literature reviewed, could be detected from the quantification of direct nursing care time. For example, the current movement within hospitals to measure the amount of nursing care provided has potential for identifying the effects of specific hospital policies on staffing levels. As more broadly based comparative studies are conducted among hospitals, differences directly attributable to policies may well be identified.

Personnel Factors

Gaps were also found in the literature relating to personnel factors. Information was obtained on only three of the topics: educational preparation of nurses, nurse staffing patterns, and the use of part-time and agency personnel (Chapter 4). Here, it should be said that the effect of different educational preparation of nurses on staffing levels remains inconclusive. The literature suggests that, while there may be perceived differences in performance levels according to educational preparation, the practice setting frequently obliterates these differences and all graduate nurses are called upon to perform the same nursing activities. While staffing methodologies often acknowledge different contributions in the delivery of care from professional and nonprofessional nurses, they have rarely distinguished between the different levels of professional nurses. As pointed out by one investigator, it may well be that graduates of all types of educational programs become equal in ability over time. The effect of educational preparation on other questions related to staffing, such as quality of care, duration and content of direct patient care, efficiency, and costs, remains undefined as well.

The relationship between staffing patterns, i.e., the mix of professional and nonprofessional nursing personnel, and staffing levels appears to be closely related to many other aspects of organization and delivery of care. The literature reflects the trend towards the increased use of professional nurses. This trend occurs in a very positive climate, anticipatory of improvements in quality, nurse and patient satisfaction, and cost-benefit ratios. Research in support of these improvements, however, is lacking. The difficulties inherent in singling out the effects of alternative staffing patterns are great. As suggested by one investigation, factors such as motivation, attitude, leadership qualities, and organizational abilities of charge nurses are as important to the study of staffing patterns as are the changes in methods of patient assignment and role classification that occur as a result of changes in staffing patterns.

Literature on the impact of part-time and agency personnel on staffing represents the third personnel factor reviewed. There is a great deal of discussion of this topic, but little research. The recent proliferation of agencies providing temporary personnel to institutions has created a dilemma. On the one hand, the agencies offer the contracting hospital the opportunity to maintain adequate staffing levels, while on the other hand creating for the same institution concern over the quality of care and morale among hospital-employed nurses. For the nurses employed by the agencies, the advantages of flexible hours, selective assignments, and improved benefits must be weighed against the lack of stability, peer group support, and accumulated status or promotional opportunities. Nor have the issues of cost been studied in detail; the few surveys conducted report conflicting views as to whether the use of agency personnel is in fact cost effective. Also, the implications for nurse staffing remain unidentified, and the impact of part-time personnel and, in particular, agency personnel, on quality of care, satisfaction of nurses and patients, duration and content of direct care, care planning and assessment, and turnover and absenteeism requires investigation.

Patient Care Requirements

The demand for care, expressed in terms of patient requirements, represents the single most important factor affecting nurse staffing. Patient classification systems appear the most promising approach to the determination of nursing resources in response to requirements for care. Since the development of patient classification systems in the 1960s, the literature on nurse staffing has been dominated by discussions of these systems. Their effect on staffing has been demonstrated in a number of areas, such as improved distribution of nursing care time in response to care demands and improved utilization of nursing personnel resources. While the timely adjustment of nursing resources to patient requirements has provided improved means for monitoring costs, the implications for quality have not been well documented. There is a general assumption that having the right nurses available at the right time to provide care in response to assessed needs will enhance the quality of care; however, the magnitude of the relationship between hours of care provided and levels of quality is difficult to document. What is needed are sensitive quality measures that can link care planning to health outcomes.

The number of patient classification systems continues to increase and each new system tends to be presented as an improvement over earlier ones. Moreover, the new systems appear to be increasingly complex, but comparative studies are lacking. Consequently there is no evidence that new systems in fact have improved the reliability or validity of the estimates of patient care requirements.

OPERATIONAL FACTORS

Operational factors were defined as the method or procedures that serve to convert input factors into desired output. Two major groups were defined in the conceptual framework of this review: those relating to the management of nursing care and those relating to the organizational mode of nursing at the unit level. Of the range of factors relating to the management of nursing care, only four were discussed in the literature in regard to their impact (real or perceived) on staffing: nursing service organization, unit management, scheduling, and the modified work week. On the other hand, a great deal of literature exists on the organization of nursing care at the unit level.

Management

The literature on nursing service organization reflects the movement towards decentralization. While there are few if any rigorous research efforts, evaluations suggested that decentralization offers improvements in decision making, morale, job satisfaction, efficiency, productivity, and the quality of care. The relationship between administrative structure and the number and kinds of staff needed was not addressed, however. Brief mention was made of an alternative organizational structure, the matrix organization.

The literature on the unit management system is extensive, although most of the major work was conducted some years ago. Unit management systems have an impact on nurse staffing in many areas, and have been credited with improved quality, efficiency, and job satisfaction; however, increases in direct patient care time and decreases in the number of nursing staff have not always been observed as a result.

Scheduling practices have also been shown to have an effect on staffing. The use of cyclical scheduling, developed centrally by other than nursing personnel, has generally been credited with saving nursing time at the unit level and increasing employee satisfaction. However, as for the introduction of the unit management system, a corresponding increase in nursing time devoted to patient care has not been demonstrated. Further, the significance of computers in aiding the scheduling process has not been made obvious, and it is generally recognized that the use of a computer for scheduling only is usually not cost effective. Also, the impact of centralized cyclical scheduling on primary nursing raises some questions, principally with regard to the loss of flexibility and control at the unit level, which may hinder the assignment of primary nurses.

A number of alternatives to the traditional five-day work week have been proposed and studied in response to problems related to nurse staffing. These include the 4/40 workweek, the 7/70 workweek, and the 12-hour day. While the descriptive-evaluative literature on each of these alternatives generally supported the changes and related positive staffing outcomes such as improved quality, lowered costs, and increased staff satisfaction, the research literature was sparse and inconclusive. Indeed, the effects of modified workweek schedules on all aspects of staffing remain to be studied in depth. Another area lacking sufficient investigation is the effect of rotation schedules on the biological clocks of nurses and the altering of their circadian rhythms.

Organizational Modes of Nursing

The largest single portion of this monograph was devoted to the modes of nursing; together with patient requirements for care, these are considered to be highly significant for nurse staffing issues. Four organizational modes were discussed: team nursing, the Loeb Center system, the unit assignment system, and primary nursing. The latter three were developed as alternatives to the traditional team and functional modes of care, and in general comparative research indicated the superiority of the new modes. Specifically, benefits were observed in the area of job satisfaction, quality of care, patient satisfaction, amount of direct care, staffing costs, and utilization of personnel. Findings from systematically conducted studies, however, provide a somewhat different perspective and do not justify sweeping claims. Thus, the wholesale implementation of one of the modes to the exclusion of all others would hardly seem warranted at this time. Instead, the available evidence suggests that consideration of specific settings and conditions may dictate the need for a variety of different approaches to the organization of care at the unit level.

ENVIRONMENTAL FACTORS

Environmental factors affecting nurse staffing were presented as relatively fixed parameters and constraints that serve largely to govern or control the delivery of nursing care. Of these factors, unit design, the use of computers, and the unit dose system were found to have reported impact on nurse staffing.

Many of the alternatives to the traditional design of a nursing unit, such as the circular, spoke, and Friesen designs, were conceived to create more efficient and effective settings for nursing care. Research findings in this respect, however, are inconclusive. There is general agreement that many of the alternative designs offer improvements in the area of personnel utilization and increase direct patient care time and staff satisfaction, but there is no general agreement on which specific design has the greatest impact. The multiplicity of factors that must be considered in studies of the effects of design changes complicates research. Like so many other factors affecting staffing, the uniqueness of specific settings and conditions may well dictate the need for a variety of design configurations.

The use of computers in nursing has been cited as having potential for improving nursing practice, charting, care planning, patient monitoring and communications, and personnel scheduling. Little concrete evidence of their benefits, especially in the area of cost effectiveness, has been presented. On the other hand, there appears to be some justification for the movement towards computer-assisted programs, especially in the area of management information systems and patient monitoring.

The effect of unit dose medication distribution systems on nurse staffing issues has been studied at length. The time spent by nursing personnel on medication activities has been shown to decrease with implementation of unit dose systems. The time savings have in part been transferred to direct patient care activities.

Thus, implementation of the unit dose system has not resulted in a decrease in total nurse staffing hours; rather, it has most often brought about improved utilization of nursing time. In the area of quality of care, reduction of medication errors has been the single most important contribution of the unit dose system.

CONCLUSIONS AND RECOMMENDATIONS

Several limitations of this review must be recognized. First, the framework selected for the literature review and critique was derived from a basic systems model characterized by inputs and outputs. Once committed to paper, the framework represents a static and oversimplified approach to the organization of variables. The investigators recognize that the true model is both dynamic and complex. The choice of framework was, however, dictated by the existing literature on the variables affecting nurse staffing, which largely ignores the interrelationship of multiple variables.

Second, there may well be some important developments and findings not included in the literature reviewed. Certain sources of information were out of the scope of the search, principally unpublished dissertations, reports by proprietary firms, and in-hospital studies. It is also possible that relevant studies were published in journals not readily identified with the nursing field and thus not searched. Finally, the investigators recognize the risk in interpreting the works of others. While every effort was made to scrutinize all the literature reviewed, the potential for misinterpreting the intent of the authors is acknowledged.

On the other hand, the large number of articles available for review confirms that nurse staffing is a topic of great interest, concern, and debate. Several factors can be singled out that explain its attraction to researchers.

Nursing personnel typically constitute about one-half of the total personnel employed by a hospital, which in turn accounts for about 25-30 percent of total hospital expenditure. Nurse staffing decisions, therefore, can have a major effect on hospital costs. Much of the research has in fact had as its central focus the issue of costs, and the aim has been to improve staffing precision in an effort to control costs.

Simply stated, the goal is to identify nurse staffing coefficients with sufficient precision to permit effective response to the nursing care requirements of patients. While the goal may be clear, the complexity of the issues obscures the outcome. The major determinant of nurse staffing, the demand for care, and the unit of production, effective care, are both nebulous and intractable entities. The problem is one of operationalizing the concepts of both *patient care requirements* and *effective nursing care*.

Discussions of patient care requirements raise philosophical issues and debates as to the relationship between real needs and actual care provided. As pointed out by Aydelotte (1973), the relationship is not clear and there is no empirical evidence to suggest that there is any validity in the assumption that the care provided is what is truly required. Presently, patient classification schemes serve as surrogates of patient requirements for care. How well they serve this purpose is unlikely to be determined until measures of quality become more specific.

The identification of effective nursing care is equally challenging. Operationalization must address such questions as: What constitutes quality of nursing care? How does it relate to cost, how much of it is affordable, and what part of it is essential regardless of cost? While much research on the quality of nursing care has been done, measures sensitive to the relationship between staffing and patient recovery and to the quality of life have yet to be developed.

In addition to the central determinant of patient requirements for care, a number of other influencing forces serve to expand the domain of nurse staffing. The interdependent nature of hospital activities makes a study of nurse staffing that considers only the presenting requirements of patients inadequate. The number of other factors that can and do affect the determination of nurse staffing is large and the framework presented in Chapter 2 represents an attempt to document some of these. To a large extent, the research conducted to identify and define the impact of these factors has not been definitive. The research on primary nursing exemplifies this point. While primary nursing was offered as an improved mode of organization, research generally ignored the impact of individual nurses on the provision of care. For example, the motivation, attitude, leadership and organizational abilities of nurses, and in particular of charge nurses, could also be considered as an important determinant.

In addition, many of the influencing factors are highly interrelated. Thus, the combined effect of a certain set of factors is not necessarily the same as the sum of the effect of individual factors. Again, the research evidence is disappointing. Of the literature reviewed, few studies considered the impact of multiple variables. Moreover, even when the investigators were aware of the importance of other factors, they generally failed to describe the study settings in sufficient detail to permit the nature of other factors to be determined.

The adoption and implementation of schemes for the improvement of nurse staffing offer many challenges. The hospital is a sensitive social system and as such the power of informal organization is important; it may either facilitate or resist change. It may be argued that the plethora of staffing methodologies based on patient classification systems is in part a response to the difficulties encountered with change. While it is recognized that these methodologies are limited in their response to the total nurse staffing question, many do afford the opportunity for substantial improvements. The continued development of these methodologies, the differences among which appear insignificant on the whole, suggests that their lack of general implementation has been attributed to their lack of responsiveness. It is quite likely that the lack of widespread acceptance and use relates more to the problems associated with the acceptance of change, however. Few methodologies address the very real question of how or where users might intervene to effect the proposed change, or identify the factors that influence the feasibility of change. The problem is not unique to patient classification, nor to nurse staffing, but it can serve as an example of change that requires understanding of both the formal and informal organization of both nursing and hospital administration.

On the other hand, the literature review identified widespread implementation of some other innovations in nursing which did not appear to be fully developed or ready for implementation. Many of the authors failed to recognize that an idea, scheme, or concept requires progression through specific developmental steps before widespread application and generalization are appropriate.

As a minimum, the research process involves problem formulation and conceptualization, literature review, and reference to an appropriate theoretical framework. In many instances the documents reviewed in this monograph indicated that researchers failed to lay the proper research foundation and plunged directly into data collection in search of support for a new concept or program. Follow-up studies have been few and initial results of an innovation have been presented as definitive outcomes. These results, often based on inadequate research, have then been accepted without question and widespread implementation has followed. The work on primary nursing serves to illustrate the point, in that much attention has been placed on the implementation of primary nursing without prior operational definition of the concept. Moreover, little attention has been given to how this concept can be integrated with staffing methodologies that are based on the allocation of nursing resources in response to variable requirements for care.

While the consequences of premature application of alternatives in nurse staffing may not be as critical as those in the field of biomedical research, for example, they nevertheless need to be considered. Responsibility for the appropriate research, development, and implementation does not lie with the researchers alone: it must be assumed by the entire nursing community, including nurse administrators, educators, and practitioners.

Specifically, the following recommendations are offered:

- Innovative concepts such as changes in the organizational mode should be subject to rigorous study before widespread implementation, in order to determine their degree of effectiveness in a variety of operational settings.

- The dynamics of the process of change must be recognized. It was evident from the literature that some staffing improvements have been ignored because of the difficulty in effecting change, while others have failed because implementation ignored the dynamics of the change process.

- Greater attention and care to the selection and development of study designs is recommended. While the difficulties inherent in achieving a true experimental design in staffing studies are recognized, the generalizability of relevant findings could be greatly enhanced by increased attention to the control of intervening variables and the documentation of the parameters of the study setting.

- Greater attention should also be devoted to instrumentation. Clearly, many studies failed to establish or report on the reliability and validity of the measurement instruments used. Moreover, there appeared to be little interest in the application of standardized measures among related studies. The use of standardized instruments would facilitate the comparison of findings and greatly enhance the development of theory. This is true also for study methods in general. Few studies specified sampling procedures, levels of significance, or the statistical tests selected for analysis.

- There must also be greater attention to the development and refinement of measures of the quality of nursing care. While most studies proposed alternatives to enhance the quality of care, their impact continues to be questioned in the absence of indicators sensitive to the quality of care.

- Finally there is an urgent need for greater discussion, communication, and evaluation of the interaction of the many factors affecting the nursing care process and staffing methodologies in general. It is recommended that this take the form of a series of national symposia or seminars combining the talents of researchers, educators, administrators, and practitioners.

APPENDIX A

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APPENDIX B

LITERATURE CITATIONS: INDEX BY SUBJECT AREA

The following is an index of the literature reviewed, categorized by subject areas in the order in which these are treated in the main body of the text. To permit easier identification, the citations are labeled D for descriptive literature, D-E for descriptive-evaluative works, and R for research reports.

EDUCATIONAL PREPARATION OF NURSES

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